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Section 1

Introduction

At present, the best available data relating streamflow to availability of aquatic habitat in New England have been generated by site-specific application of the Physical Habitat Simulation (PHABSIM) computer model. Modeling is one component of the Instream Flow Incremental Methodology (IFIM) that is used to assess the potential impacts of water withdrawals or diversions on aquatic species. PHABSIM quantifies the relationship between flow and habitat, resulting in Weighted Usable Area (WUA) curves for selected life stages of target species. Input data include field-measured parameters for representative stream reaches and literature values that weight life stage/species preferences for different physical habitat conditions.

A preliminary assessment of previous IFIM studies in Massachusetts and northern New England was undertaken to determine their suitability as data sources for relating “trigger” flows under the proposed Instream Flow Rules to estimate habitat availability. Initially, a total of ten reports, representing fifteen study segments, were reviewed in order to compile a descriptive matrix of critical information. These studies vary widely with respect to the geographic location of each study area, the degree of flow regulation in the subject river, the extent of the study reach, the proportions of representative mesohabitats, the number and type of target aquatic species, etc. All of the studies were conducted by private sector consulting firms, with some level of review by state and federal agencies. However, the reports differ markedly in the degree of detail that they contain, in some cases limiting their usefulness for this analysis.

Based upon careful review of the completed matrix, two studies were selected for inclusion in an objective analysis of the relationship between streamflow and habitat availability. Both of these studies were very well documented. Also, the target species and physical characteristics of the study reaches, including the upstream drainage area, are comparable. However, in one case flows are highly regulated (Waterbury Hydroelectric Project) whereas flows in the other case (Saco River Withdrawal -- Mt. Attitash Lift Corp) are unregulated.

The differences in the results from the two studies bracket conditions existing in other NH rivers that are subject to varying degrees of flow regulation. Overall, the results provide a general picture of how habitat availability changes as a function of flow rate in systems with physical characteristics that are similar to those of the studies referenced. They therefore serve as endpoints for evaluating river systems whose flow regimes and species composition falls somewhere along the continuum between the two base studies.

A methodology developed for the States of Pennsylvania and Maryland by the Susquehanna River Basin Commission was utilized to aggregate the data contained in the reports and determine trends for individual species that are expected to be representative across the state. This method makes the assumption that, of all the life stages present for the time of the year investigated, the life stage with the lowest measured amount of habitat at a given flow relative to the maximum amount of habitat at the optimum flow rate is the most habitat limited, and is therefore the most in need of protection. The Pennsylvania technique consists of a series of steps repeatedly relating the amount of habitat available to a maximum possible value at different flow rates, first for individual

life stages, then between different life stages for each species.

The resulting data was further integrated by the New Hampshire Department of Environmental Services (NHDES) to derive a graphical product that could exhibit general tendencies in the amount of habitat available to all the sampled species life stages in response to varying flows. A method with results independent of the drainage area of the sampled sites was a goal of the investigation. To avoid having to consider the size of the basin as a variable, a statistical value was chosen to describe the changes in available habitat for each species, instead of referencing a discrete flow rate or a flow rate based on drainage area. This was accomplished by relating the percent changes in available habitat to percent changes in flow rate calculated with respect to a specified base flow, the seasonal Q50 flow rate. Maximum and minimum percent changes from among all the sampled species at each flow rate were graphed to exhibit the extremes displayed at both study sites.

Goal of Analysis:

The goal of the analysis was to find a method to visually display general differences in available habitat at different flow rates across a range of varying streamflow conditions that exist in NH rivers.

Design of Analysis Procedure:

The procedure consisted in choosing the IFIM studies to be used, finding and applying a method to evaluate the changes in usable habitat for individual species as a whole vs. simply on individual life stages while taking into account seasonal variations, and then finding and applying a method to show the change in usable habitat corresponding to different flows for all species simultaneously.

A. Choosing the IFIM studies to be used:

All available IFIM studies for Massachusetts and northern New England were gathered and evaluated in terms of the following criteria:

1. Full range of stream habitat studied (all mesohabitats). Some studies focused exclusively on riffles out of the possible choices of riffle-run-pool that make up stream habitat. Studies that evaluated habitat types ranging from shallow-fast water to deep-slow water were deemed to be more appropriate for examining potential impacts on as many species as possible.
2. Regulated or non-regulated rivers. Since a complete picture of NH rivers would need to include both of these flow regimes, an effort was made to find studies that spanned the different flow conditions exhibited by both of these two different types of rivers.
3. Maximum number of species possible. IFIM studies that included species that were sensitive to different flow conditions (high flow as well as low flow) were preferred.

4. Quality of available discharge (flow) data used for the study. Studies done in the vicinity of a United States Geological Survey, Water Resource Division gauging station with a continuous record of daily flow data were preferred.

5. Ranges in flow of the rivers investigated. Studies that investigated high as well as low flow conditions were preferred.

An evaluation determined that two studies best fit these criteria. They were "Evaluation of the Saco River in Bartlett, N.H.," for the Mt. Attitash Lift Corporation by Wagner, Heindal, and Noyes, Inc., and "Little River Instream Flow Study," done in Waterbury, VT for the Green Mountain Power Company by Gomez and Sullivan Engineers, P.C. The Saco River is an unregulated stream, while the Little River is a highly regulated system.

Both base studies used the Instream Flow Incremental Methodology (IFIM). This method uses computer models that integrate river hydraulics and projected habitat availability to compare the amount of habitat for different species life stages at different flow rates. Both studies utilized the Physical Habitat Simulation (PHABSIM) computer model developed by the U.S. Fish and Wildlife Service to achieve this. PHABSIM calculates the Weighted Usable Area (WUA) of habitat available for an individual species life stage based on a set of species-dependent Suitability Index (SI) criteria that are measured at the site during a field survey. Typical SI are the velocity of the water, the type of bottom material in the stream (substrate), and depths.

Some differences in the details of the method of analysis and evaluation of site-specific parameters exist between these two studies, as well as between these studies and site-specific studies conducted at other locations. In all cases, study design and implementation was subject to the discretion and professional judgment of the investigators. However, the goal for all of these studies was the same, to relate differences in available habitat to different flow rates. Variations in the IFIM approach may very well be justified by site-specific conditions. The NHDES analysis was not conducted to critique and evaluate the methods used by the investigators, but instead to utilize their results. The appropriateness of the exact steps (choice of suitability criteria, binary vs. univariate standards for data, etc.) used in the IFIM studies was not reviewed. Rather, the assumption was made that the investigators selected the best techniques possible to determine the resulting WUAs for their respective study sites.

Some details of the two studies follow:

Saco River Study:

Species: Brown Trout, Rainbow Trout, Salmon, Longnose Dace, White Sucker.

Habitat Suitability Criteria (binary system used): Velocity, Depth, Substrate Type as well as Temperature for the Rainbow Trout.

Drainage Area: 100 mi²

Percent Mesohabitat: Riffle	47.2%
Pool	11.6
Run	39.0
Channelized	2.2

Little River Study:

Species: Brown Trout, Rainbow Trout, Longnose Dace, Longnose Sucker, Macroinvertebrates

Habitat Suitability Criteria (binary system used): Velocity, Depth, Substrate Type

Drainage Area: 109 mi²

Percent Mesohabitat: Riffle	39%
Pool	18
Run	30
Gorge	13

Note: The original life stages information was not available at the time of this analysis for the Little River Study, so the WUA values were manually scaled off of graphs in the original IFIM report. The values used in the Saco River analysis came directly from tables in the IFIM report.

B. Finding and applying a method to evaluate the changes in usable habitat on individual species as a whole, taking into account seasonal variations:

At the suggestion of the NH Fish and Game Dept., a method used in the States of Pennsylvania and Maryland by the Susquehanna River Basin Commission to assess the differences in available habitat at different flow rates for Brown and Brook Trout throughout the various months of the year was investigated and chosen as the method to be used. The method used is called the Renormalized Weighted Usable Area (RMWUA) method. This consists of a two-step process outlined below.

1.) The amount of habit available to an individual life stage of a species (adult, juvenile, spawning, etc.) across the full range of flows is related to a common denominator so that they can be directly compared. The common denominator used is the maximum recorded value among the selections, and amounts to expressing the WUAs at each flow rate as a percentage of the maximum value.

The process consists of first listing the WUA's for an individual life stage of a species along with its corresponding flow rate in a table. From this table the largest value of WUA is selected from the listing. All the WUA's in the table for the life stage are then divided by the maximum value. The result is a comparison in decimal (or percent) format of how the WUA value at each flow compares to the WUA value at the flow representing the maximum WUA for that life stage. This process is called normalizing, and the results called Normalized Weighted Usable Areas (NWUAs).

2.) These resulting ranked values for each individual life stage are then compared to the resulting values from among the other life stages of that species at each flow rate to determine the minimum amount of habitat among all the life stages for the species as a whole at each flow rate. These values are also related by a common denominator, which again is the maximum value among the selected values across all the flow rates. The result again is equivalent to expressing each selected value at each flow rate as a percentage of the maximum habitat value for the given range of flows.

Each life stage's WUA is compared to those of the species' other life stages at each flow. The minimum value among the group is picked to represent the normalized WUA for the species at this flow rate. All the normalized WUA's selected in this manner are then compared to the largest value among them for all the flows, and each value is divided by this maximum value. This process is called renormalizing, and the resulting final values at each flow are called the Renormalized Minimum Weighted Usable areas (RMWUA). Note that because the Saco Basin was 100 mi², that the flow in cfs also was equivalent to c fsm values. Due to this, the graphs are labeled c fsm vs. cfs. To convert to cfs, simply multiply by 100 for these graphs.

This process must take into account the presence or absence of each of the species' life stages at any particular time of year, a characteristic of a species' life cycle known as "periodicity." The Susquehanna River Basin study addressed the presence of different life stages within each month of the year. Due to the seasonal nature of NH's proposed Instream Flow Rules, the periodicity used in the NHDES's evaluation of the study data followed the definitions of the four seasons as outlined in the State of NH's proposed regulations. The definition of these seasons is as follows:

Winter:	January 1 to March 15
Spring:	March 16 to May 31
Summer:	June 1 to October 31
Fall:	November 1 to December 31

The periodicity information provided in the Little River study for the respective target species life stages was used in the NHDES analysis of the Little River WUA data. The periodicity information for the Saco species life stages was taken from various sources. The Little River study provided information for Rainbow Trout and Longnose Dace, while the Deerfield River IFANA Study provided comparable data for the Salmon life stages.

For the Brown Trout, available literature indicated a year-round presence for Adults and Juveniles. For the Brown Trout Fry life stage, other NH studies indicated that one or the other of Early and Late Fry stages were present in all seasons, so the combined Fry category was applied in all seasons for the Saco River as well. Various studies report that spawning for Brown Trout takes place beginning in late Summer, and continues throughout the Fall and Winter. The Little River Study also reported spawning to occur in the Spring. However, the Summer instances seem to occur only in October. At the suggestion of a consultant, spawning was therefore excluded from the Summer season.

The Saco River study only contained information on Fry and Juvenile/Adult life stages of White Sucker. The Juvenile/Adult curves were applied year-round. Since no information was available regarding the duration of the Fry life stage of the White Sucker, it was presumed to exist in streams year-round.

In the analysis of the Saco River study, after consulting with the NH Fish and Game Department, it was decided to not include the spawning stage of the Rainbow Trout for the summer season in the analysis. This species is a put-and-take species in this stream, and so the spawning lifestage is not significant in maintaining the health of the species at this location, and using it skews the data set. The other life stages for the Rainbow Trout were included year round in the analysis since they provide important information to managers of the stream.

C. Finding and applying a method to show the change in usable habitat corresponding to different flows for all species simultaneously:

In order to arrive at a general sense of the difference in habitat available for aquatic life forms in NH rivers at different flow rates, a method had to be found to concurrently display all the available data together for all the species studied, in a format that clearly displayed prevalent trends in the data. Because a method with results independent of the drainage area of the sampled sites was a goal of the investigation, it was decided to use a common statistical parameter to relate changes in habitat. The seasonal Q50 flow rates were chosen as this base flow rate. Because the flows are either above or below this flow rate 50 percent of the time, differences in habitat compared to this one are a good general indicator of the magnitude of relative changes.

The process used was to determine the available habitat for each species at the seasonal Q50 flow rate, then relate the amount of habitat available at each other flow rate as a percent of this base value. The flow rates themselves were related to the Q50 flow rate in a similar manner. The seasonal Q50 flow rate at each site was determined by a flow-duration analysis, which is a method that takes all the daily flow rates, ranks them from largest to smallest, and calculates the probability that these flows will be exceeded.

For the purpose of displaying the individual species response to changes in flow rates, the renormalized species curve was graphed. The Little River RUWUAs were graphed vs. flow rate, as were the Saco River RUWUAs. Again note that because the Saco Basin drainage area is 100 mi², this is equivalent to graphing vs. CFSM.

Section 2

Example of Calculation Procedure:

As outlined above under Design of Analysis Procedure, the following is an explanation of the steps followed in arriving at the final resulting graphs using the Saco River study.

1.Calculating Normalized Weighted Usable Area (NWUA) and Renormalized Minimum Weighted Usable Area (RMWUA) for an individual species:

The WUA data was taken from the graphs for each of the species life stages in the IFIM study, and entered into tabular format under the column heading Wt. Usable Area. The maximum value for each column was found by inspection (see the number below each column). All the numbers in the Wt. Usable Area column were divided by this value to arrive at the numbers in the next set of columns with the heading Normalized Wt.ed Usable Area. Note the maximum value becomes 1, and all the other values are related to this number as decimal values.

2. Calculating Minimum Normalized Weighted Usable Areas:

For different possible combinations of life stages, at each flow the minimum value was selected from the Normalized Wt.ed Usable Area columns for each flow rate. Note these values are different combinations of normalized values from the first normalization process. To relate all the new values to a common standard, this column is also normalized using its largest value (these values again can be found at the bottom of the column). These are the Renormalized Minimum Weighted Usable Area values found in the next set of columns. Using the available periodicity values, the mix of renormalized values from different life stages appropriate to each season are chosen. These values are graphed vs. flow rate on the accompanying graphs.

3. Next, the combined life stage results from the previous step for all the sampled species are assembled by season. Using a flow duration analysis, the seasonal Q50 discharge values for the river are determined. Using straight line interpolation, the Renormalized Minimum Weighted Usable Area values value at the seasonal Q50 is calculated for each species (The result of the calculation is displayed at the center of the next page of calculations).

The percent difference between this value for each species and the Renormalized Minimum Weighted Usable Area values for that species at each of the sampled discharges is calculated. The percent difference in flow rate from the seasonal Q50 rate is also calculated. These two percentages are graphed vs. each other. To help in understanding the range of flow rates that are under discussion, the actual flow rates that correspond to the percent change from seasonal Q50 are also graphed. The maximum, minimum, and average values are calculated from among all the species, and these values are graphed vs. the percent change in flow rates. The shape of these graphs is a function of the species sampled in the study, as different species represent the maximum or minimum value plotted at different discharges.

The final step is to relate the results across species. A target flow rate and corresponding RMWUA for each of the species at that target flow rate are selected. At each of the other rates of flow, the percent change in the rate of flow as well as the percent change in RMWUAs from the base flow rate and base RMWUA are calculated. To avoid having to consider the size of the basin as a variable, a statistical value was chosen to describe the changes in available habitat for each species, instead of a discrete flow rate. The target flow rate chosen here was the Q50 flow rate, which is the flow rate exceeded fifty percent of the time by the recorded flow rates, and

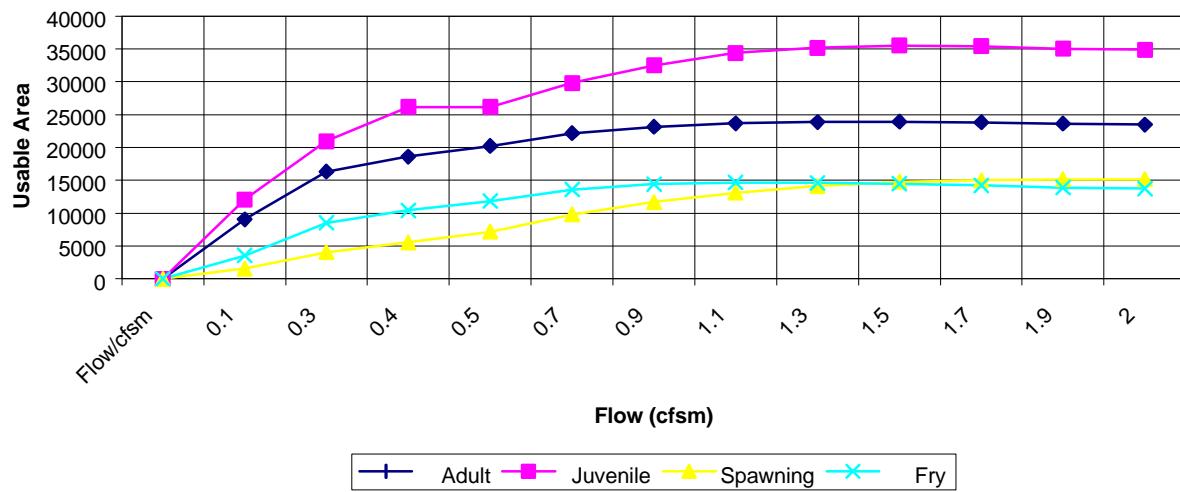
which was greater than the remaining flow rates the other fifty percent of the time. This value was determined by a flow-duration analysis, a standard statistical test used by hydrologists.

These percent changes in RMWUA with percent changes in flow rate relationships were then graphed to determine if general trends could be perceived. The maximum, minimum, and average percent change in RMWUAs from among all the species sampled was determined at each flow rate and graphed. Note the results at each flow rate can come from any of the species, whichever showed the most and least amount of change in habitat for the corresponding change in flow rate from the chosen target flow rate. A separate graph identifying the species contributing to the maximum/minimum graphed values is also presented, to distinguish which species control each of these parameters at each flow rate.

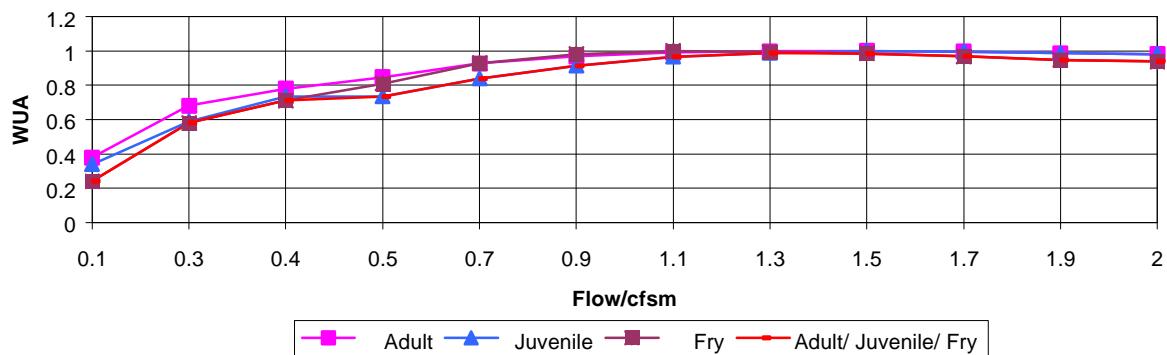
Wt. Usable Area				Normalized Wt.ed Usable Area				
Flow/cfsm	Adult	Juvenile	Spawning	Fry	Adult	Juvenile	Spawning	Fry
0.1	9049	12060	1560	3537	0.37854	0.339489	0.102909	0.241335
0.3	16300	20963	4033	8508	0.681866	0.590108	0.266047	0.580513
0.4	18630	26139	5554	10410	0.779335	0.735812	0.366383	0.710289
0.5	20242	26139	7175	11863	0.846768	0.735812	0.473316	0.80943
0.7	22166	29840	9816	13612	0.927254	0.839995	0.647536	0.928766
0.9	23151	32499	11679	14399	0.968458	0.914846	0.770433	0.982465
1.1	23670	34373	13113	14656	0.990169	0.967599	0.865031	1
1.3	23870	35163	14140	14592	0.998536	0.989838	0.932779	0.995633
1.5	23905	35524	14772	14454	1	1	0.974471	0.986217
1.7	23802	35398	15024	14205	0.995691	0.996453	0.991094	0.969228
1.9	23607	35049	15159	13907	0.987534	0.986629	1	0.948895
2	23463	34866	15156	13762	0.98151	0.981477	0.999802	0.939001
Maximum : 23905 35524 15159 14656				Summer				
Minimum Normalized Wt.ed Usable Area				Renormalized Minimum Wt.ed Usable Area				
Flow/cfsm	Adult/ Juvenile/ Fry	Adult/ Juvenile/ Spawning	Adult/ Juvenile/ Spawn	Adult/ Juvenile/ Fry	Adult/ Juvenile/ Spawning	Adult/ Juvenile/ Spawn	Adult/ Juvenile/ Fry	Spring Autumn Winter
0.1	0.241335	0.102909	0.339489	0.102909	0.243812	0.103834	0.339489	0.105605
0.3	0.580513	0.266047	0.590108	0.266047	0.586473	0.268437	0.590108	0.273017
0.4	0.710289	0.366383	0.735812	0.366383	0.717581	0.369675	0.735812	0.375982
0.5	0.735812	0.473316	0.735812	0.473316	0.743367	0.477569	0.735812	0.485716
0.7	0.839995	0.647536	0.839995	0.647536	0.848619	0.653355	0.839995	0.6645
0.9	0.914846	0.770433	0.914846	0.770433	0.924239	0.777356	0.914846	0.790617
1.1	0.967599	0.865031	0.967599	0.865031	0.977533	0.872804	0.967599	0.887693
1.3	0.989838	0.932779	0.989838	0.932779	1	0.941161	0.989838	0.957216
1.5	0.986217	0.974471	1	0.974471	0.996342	0.983227	1	1
1.7	0.969228	0.991094	0.995691	0.969228	0.979178	1	0.995691	0.99462
1.9	0.948895	0.986629	0.986629	0.948895	0.958636	0.995494	0.986629	0.973754
2	0.939001	0.981477	0.981477	0.939001	0.948641	0.990296	0.981477	0.963601

0.989838 0.991094 1 0.974471

Saco River - Brown Trout - Usable Areas for different life stages,
calculated with PHABSIM computer program, using field data and published guidelines.



Saco River, Brown Trout. Adult/ Juvenile/ Fry : Summer Curve



Flow/cfs	Brown	Rainbow	Salmon	White	Longnose
	Trout	Trout	Sucker	Dace	
10	0.243812	0	0.23327	0.508181	0.07726
30	0.586473	0.012716	0.472499	0.896273	0.313219
40	0.717581	0.041559	0.596568	0.980563	0.445625
50	0.743367	0.085599	0.748578	1	0.571904
70	0.848619	0.170577		1	0.909524
90	0.924239	0.383644	0.867829	0.82329	0.910524
110	0.977533	0.75147	0.786518	0.741181	0.987701
130	1	1	0.703437	0.681302	1
150	0.996342	0.928746	0.62857	0.631867	0.956926
170	0.979178	0.877372	0.567981	0.599105	0.902426
190	0.958636	0.820168	0.50537	0.566109	0.860378
200	0.948641	0.79737	0.477003	0.553882	0.83643

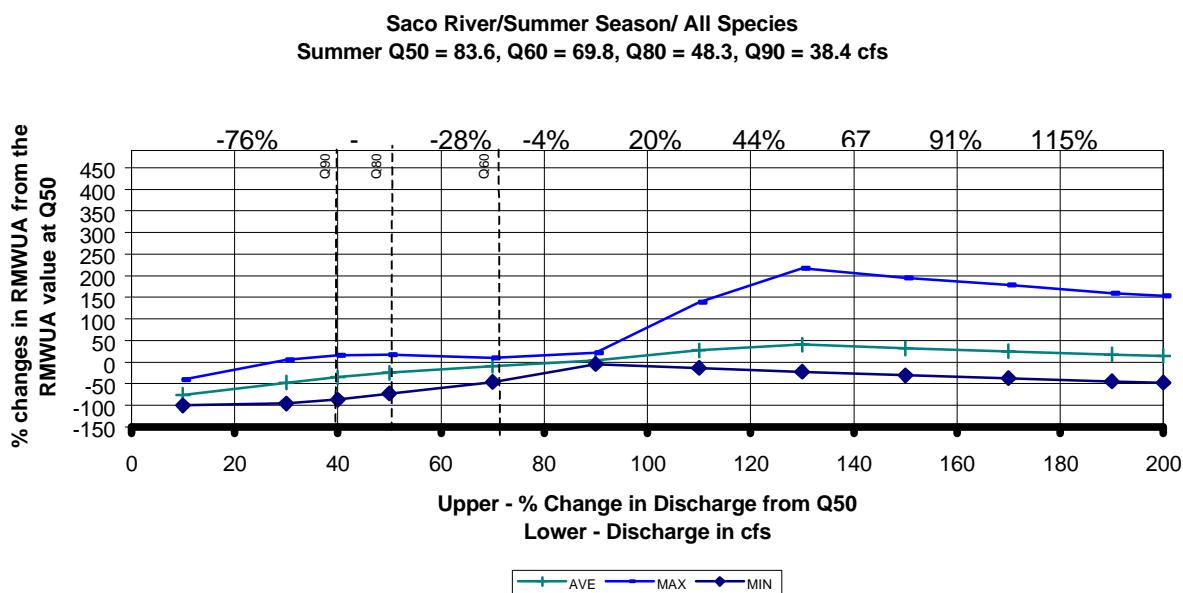
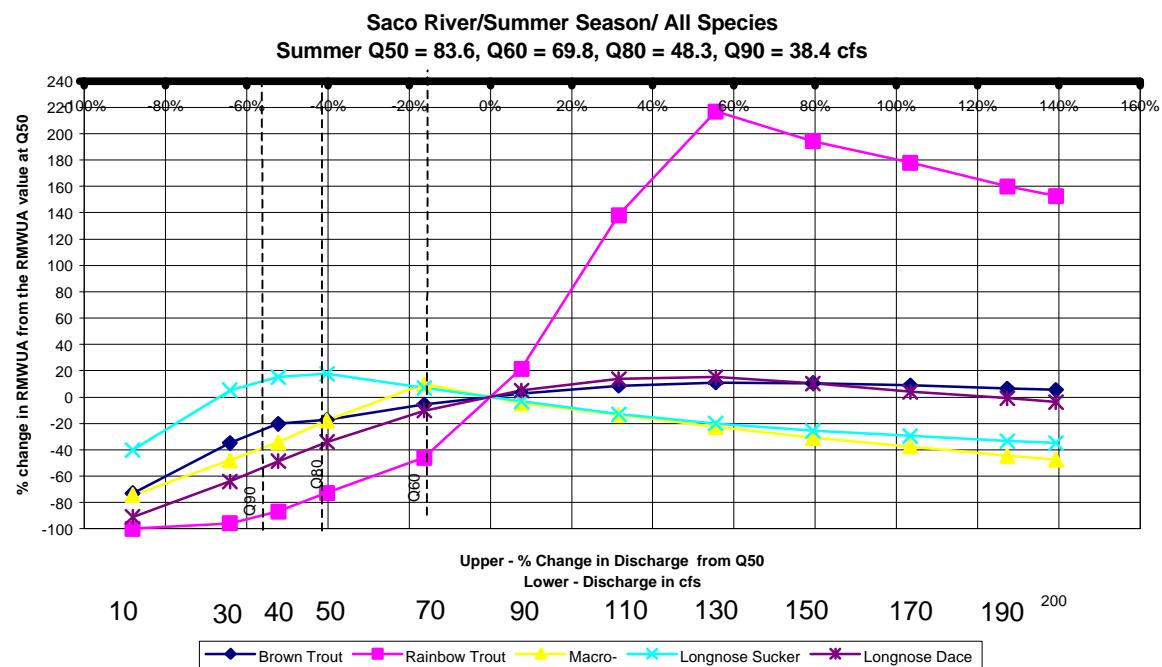
Maximum : 1 1 1 1 1

Summer Q50 = 83.6 interpolated WUA's at Q50 for each species

Brown	Rainbow	Salmon	White	Longnose
Trout	Trout	Sucker	Dace	
0.90004	0.315463	0.910124	0.850885	0.868074

At the given Q reduced for Q50, this is the corresponding
% change in WUA from WUA@Q50 for the species

Flow/cfs	Q50		Brown	Rainbow	Macro-	Longnose	Longnose	AVE	MAX	MIN
	reduced	by this %			Trout	Trout	Invert.s	Sucker	Dace	using all species
10	-88%		-72.911	-100	-74.3695	-40.2762	-91.0998	-75.7313	-40.2762	-100
30	-64%		-34.8393	-95.9692	-48.0841	5.334146	-63.9179	-47.4953	5.334146	-95.9692
40	-52%		-20.2723	-86.8261	-34.452	15.2403	-48.665	-34.995	15.2403	-86.8261
50	-40%		-17.4074	-72.8656	-17.7499	17.52467	-34.118	-24.9233	17.52467	-72.8656
70	-16%		-5.7132	-45.9279	9.875158	6.891554	-10.3916	-9.05319	9.875158	-45.9279
90	8%		2.688564	21.61312	-4.64713	-3.24308	4.890169	4.260327	21.61312	-4.64713
110	32%		8.609927	138.2123	-13.5813	-12.893	13.78074	26.82574	138.2123	-13.5813
130	56%		11.10613	216.9949	-22.7098	-19.9302	15.19759	40.13173	216.9949	-22.7098
150	79%		10.69972	194.4076	-30.9358	-25.7401	10.2356	31.73341	194.4076	-30.9358
170	103%		8.792693	178.1226	-37.593	-29.5904	3.95726	24.73783	178.1226	-37.593
190	127%		6.510382	159.9889	-44.4724	-33.4682	-0.88649	17.53444	159.9889	-44.4724
200	139%		5.399862	152.7623	-47.5892	-34.9052	-3.64533	14.40448	152.7623	-47.5892



Section 3

Yaco River Site - Brown

Normalized Wt.ed Usable Area

Wt. Usable Area

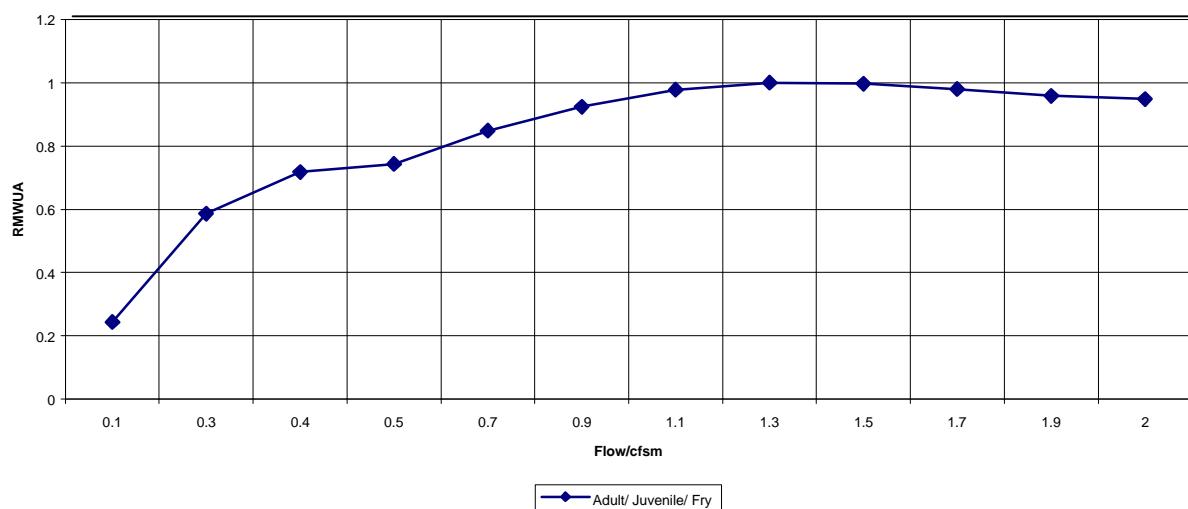
Flow/cfsm	Adult	Juvenile	Spawning	Fry	Adult	Juvenile	Spawning	Fry
0.1	9049	12060	1560	3537	0.37854	0.339489	0.102909	0.241335
0.3	16300	20963	4033	8508	0.681866	0.590108	0.266047	0.580513
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1.1	23670	34373	13113	14656	0.990169	0.967599	0.865031	1
1.3	23870	35163	14140	14592	0.998536	0.989838	0.932779	0.995633
1.5	23905	35524	14772	14454	1	1	0.974471	0.986217
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1.9	23607	35049	15159	13907	0.987534	0.986629	1	0.948895
2	23463	34866	15156	13762	0.98151	0.981477	0.999802	0.939001

Maximum :	23905	35524	15159	14656	Summer			Spring
Flow/cfsm	Fry	Spawning	Fry	Spawning	Renormalized Minimum Wt.ed Usable Area			Autumn
	Adult/ Juvenile/			Winter				
	Fry	Spawning	Fry	Spawning	Fry	Spawning	Fry	Adult/ Juvenile/ Fry/ Spawn
0.1	0.241335	0.102909	0.339489	0.102909	0.243812	0.103834	0.339489	0.105605
0.3	0.580513	0.266047	0.590108	0.266047	0.586473	0.268437	0.590108	0.273017
0.4	0.710289	0.366383	0.735812	0.366383	0.717581	0.369675	0.735812	0.375982
0.5	0.735812	0.473316	0.735812	0.473316	0.743367	0.477569	0.735812	0.485716
0.7	0.839995	0.647536	0.839995	0.647536	0.848619	0.653355	0.839995	0.6645
0.9	0.914846	0.770433	0.914846	0.770433	0.924239	0.777356	0.914846	0.790617
1.1	0.967599	0.865031	0.967599	0.865031	0.977533	0.872804	0.967599	0.887693
1.3	0.989838	0.932779	0.989838	0.932779	1	0.941161	0.989838	0.957216
1.5	0.986217	0.974471	1	0.974471	0.996342	0.983227	1	1
1.7	0.969228	0.991094	0.995691	0.969228	0.979178	1	0.995691	0.99462
1.9	0.948895	0.986629	0.986629	0.948895	0.958636	0.995494	0.986629	0.973754
2	0.939001	0.981477	0.981477	0.939001	0.948641	0.990296	0.981477	0.963601

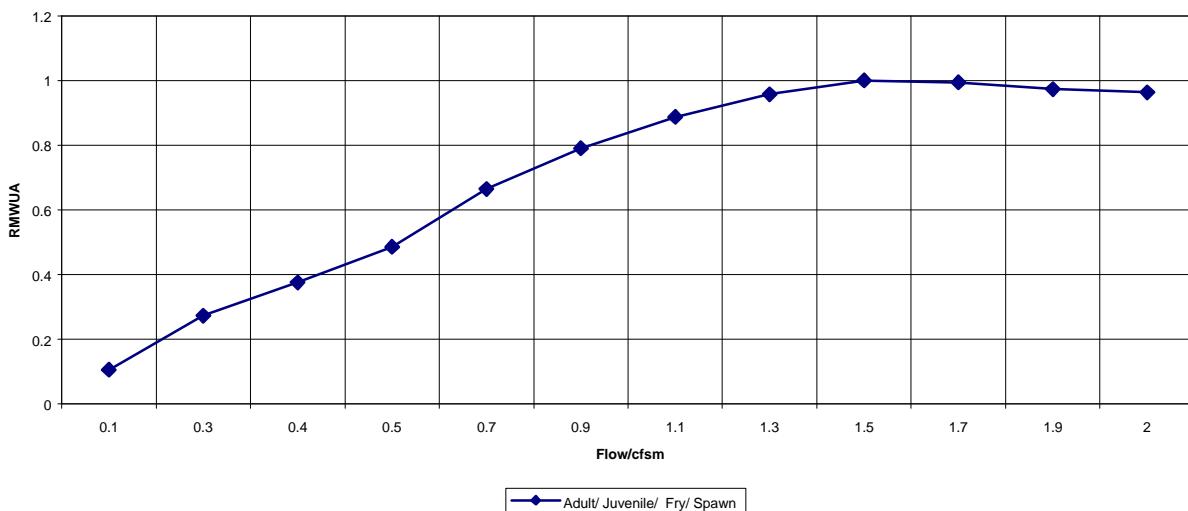
0.989838 0.991094

1 0.974471

Saco River, Brown Trout. Adult/ Juvenile/ Fry : Summer Curve



**Saco River, Brown Trout. Curve using : Adult/ Juvenile/ Fry/ Spawning
Winter, Spring, Fall Curve**



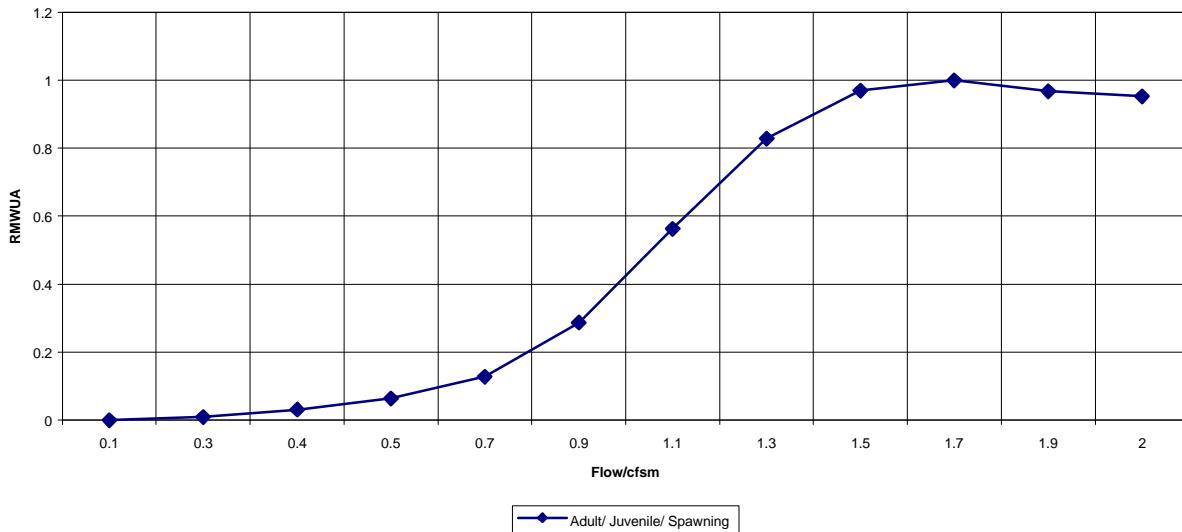
Saco River Site - Rainbow

	Wt. Usable Area			Normalized Wt.ed Usable Area					
Flow/cfsm	Adult	Juvenile	Spawning	Fry	Adult	Juvenile	Spawning	Fry	
0.1	12730	6236	1	22452	0.204936	0.452441	0.000217	0.831463	
0.3	25977	10166	41	27003	0.418195	0.737575	0.008882	1	
0.4	31459	11463	134	26997	0.506448	0.831677	0.029029	0.999778	
0.5	36255	12380	276	26330	0.583657	0.898208	0.059792	0.975077	
0.7	44443	13446	550	24371	0.715472	0.97555	0.119151	0.902529	
0.9	50950	13783	1237	22387	0.820226	1	0.267981	0.829056	
1.1	55218	13770	2423	20438	0.888935	0.999057	0.524913	0.756879	
1.3	58296	13565	3564	18862	0.938487	0.984183	0.772097	0.698515	
1.5	60886	13237	4171	17518	0.980183	0.960386	0.903596	0.648743	
1.7	62104	12848	4474	16549	0.999791	0.932163	0.969237	0.612858	
1.9	62117	12426	4601	15470	1	0.901545	0.99675	0.572899	
2	61652	12238	4616	15040	0.992514	0.887905	1	0.556975	

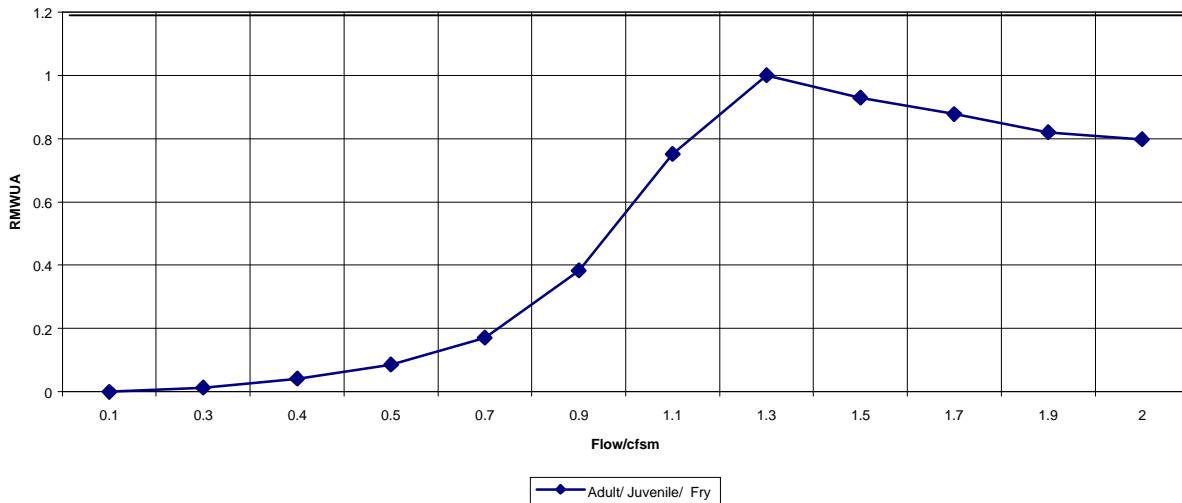
Flow/cfsm	Maximum :				Autumn			
					Summer		Spring	Winter
	Minimum Normalized Wt.ed Usable Area				Renormalized Minimum Wt.ed Usable Area			
Flow/cfsm	Adult/ Fry	Adult/ Spawning	Adult/ Fry/ Spawn	Adult/ Juvenile/ Juvenile/ Juvenile/ Juvenile/ Fry/ Spawn	Adult/ Juvenile/ Juvenile/ Juvenile/ Juvenile/ Fry	Adult/ Juvenile/ Juvenile/ Juvenile/ Juvenile/ Spawning	Adult/ Juvenile/ Juvenile/ Juvenile/ Juvenile/ Fry/ Spawn	Adult/ Juvenile/ Juvenile/ Juvenile/ Juvenile/ Fry/ Spawn
0.1	0.204936	0.000217	0.204936	0.000217	0.249853	0.000232	0.213389	0.00031
0.3	0.418195	0.008882	0.418195	0.008882	0.509853	0.009529	0.435444	0.012716
0.4	0.506448	0.029029	0.506448	0.029029	0.617448	0.031142	0.527337	0.041559
0.5	0.583657	0.059792	0.583657	0.059792	0.71158	0.064143	0.607731	0.085599
0.7	0.715472	0.119151	0.715472	0.119151	0.872287	0.127822	0.744984	0.170577
0.9	0.820226	0.267981	0.820226	0.267981	1	0.287483	0.854059	0.383644
1.1	0.756879	0.524913	0.888935	0.524913	0.922768	0.563113	0.925602	0.75147
1.3	0.698515	0.772097	0.938487	0.698515	0.851612	0.828286	0.977198	1
1.5	0.648743	0.903596	0.960386	0.648743	0.790931	0.969354	1	0.928746
1.7	0.612858	0.932163	0.932163	0.612858	0.747181	1	0.970613	0.877372
1.9	0.572899	0.901545	0.901545	0.572899	0.698465	0.967154	0.938732	0.820168
2	0.556975	0.887905	0.887905	0.556975	0.679051	0.952522	0.92453	0.79737

0.820226 0.932163 0.960386 0.698515

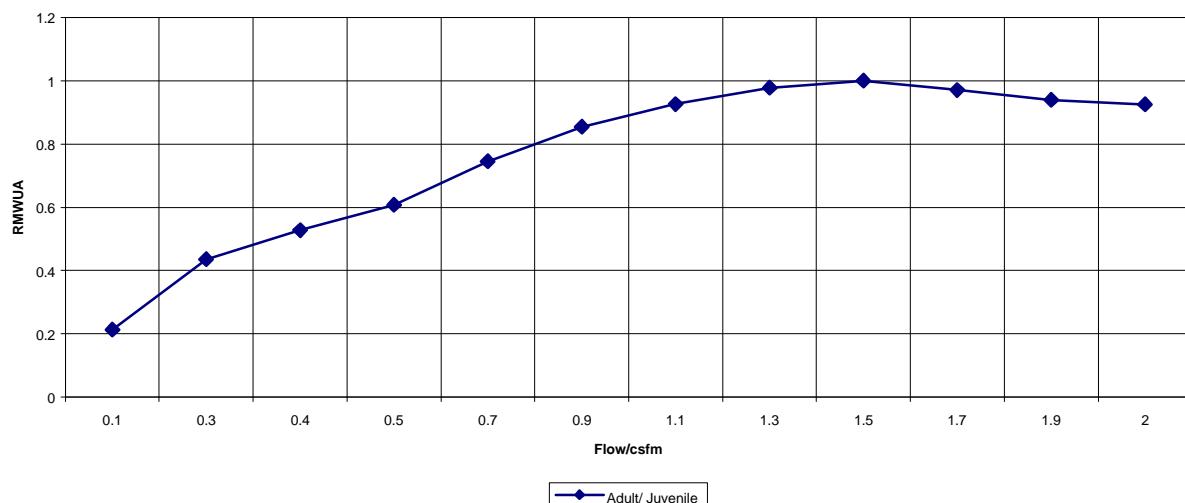
Saco River: Raininnbow Trout: Autumn Curve using : Adult/ Juvenile/ Spawning



**Saco River : Rainbow Trout :
Summer : Adult/Juvenile/ Fry/Spawning**



Saco River: Rainbow Trout : Winter and Autumn :
Adult/ Juvenile



Saco River Site - Atlantic Salmon

Wt. Usable Area

Flow/cfsm	New Fry	Juvenile	Spawning	L. Fry
0.1	18702	17280	3640	20817
0.3	22355	33466	7373	34709
0.4	20989	40275	9309	38283
0.5	19063	46216	11681	40451
0.7	15828	55326	15741	41663
0.9	13736	61510	18484	41031
1.1	12449	65441	20307	39684
1.3	11134	67844	21517	37679
1.5	9949	69279	21984	35671
1.7	8990	69827	22039	33621
1.9	7999	70193	21915	31694
2	7550	70164	21857	30731

Normalized Wt.ed Usable Area

New	Fry	Juvenile	Spawning	L. Fry
0.836591	0.246178	0.165162	0.499652	
1	0.476771	0.334543	0.833089	
0.938895	0.573775	0.422388	0.918873	
0.85274	0.658413	0.530015	0.970909	
0.70803	0.788198	0.714234		1
0.614449	0.876298	0.838695	0.984831	
0.556878	0.932301	0.921412		0.9525
0.498054	0.966535	0.976315	0.904376	
0.445046	0.986979	0.997504	0.856179	
0.402147	0.994786		1	0.806975
0.357817		1	0.994374	0.760723
0.337732	0.999587	0.991742	0.737609	

Maximum : **22355 70193 22039 41663**

Minimum Normalized Wt.ed Usable Area

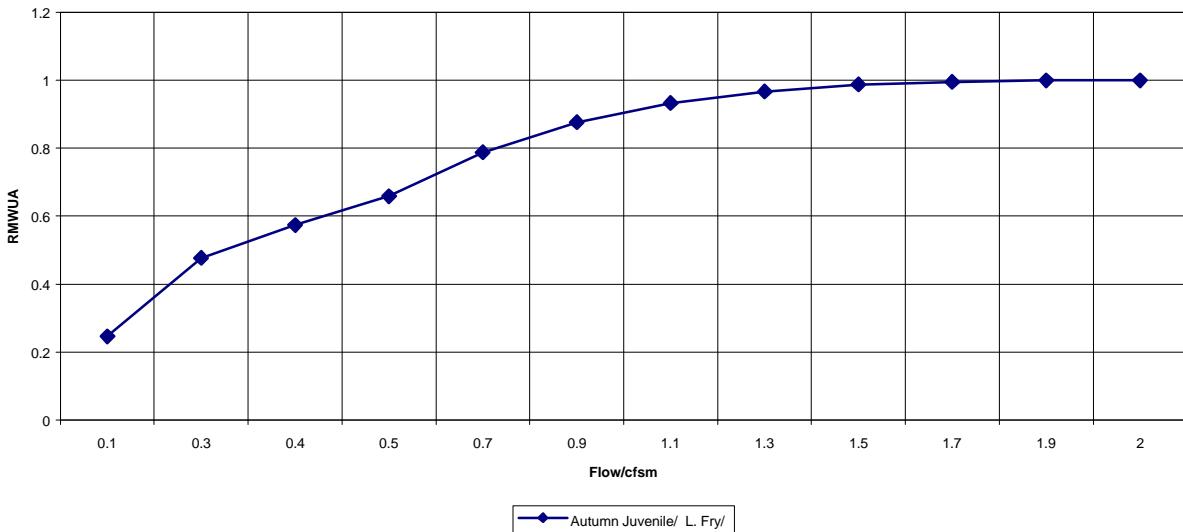
Flow/cfsm	Juvenile/ New Fry			
	L. Fry	Juvenile/ L. Fry/ Spawn	Juvenile/ L. Fry/ Spawn/ New	Juvenile/ L. Fry/ New Fry
0.1	0.246178	0.165162	0.165162	0.246178
0.3	0.476771	0.334543	0.334543	0.476771
0.4	0.573775	0.422388	0.422388	0.573775
0.5	0.658413	0.530015	0.530015	0.658413
0.7	0.788198	0.714234	0.70803	0.70803
0.9	0.876298	0.838695	0.614449	0.614449
1.1	0.932301	0.921412	0.556878	0.556878
1.3	0.966535	0.904376	0.498054	0.498054
1.5	0.986979	0.856179	0.445046	0.445046
1.7	0.994786	0.806975	0.402147	0.402147
1.9		1	0.760723	0.357817
2	0.999587	0.737609	0.337732	0.337732

Renormalized Minimum Wt.ed Usable Area

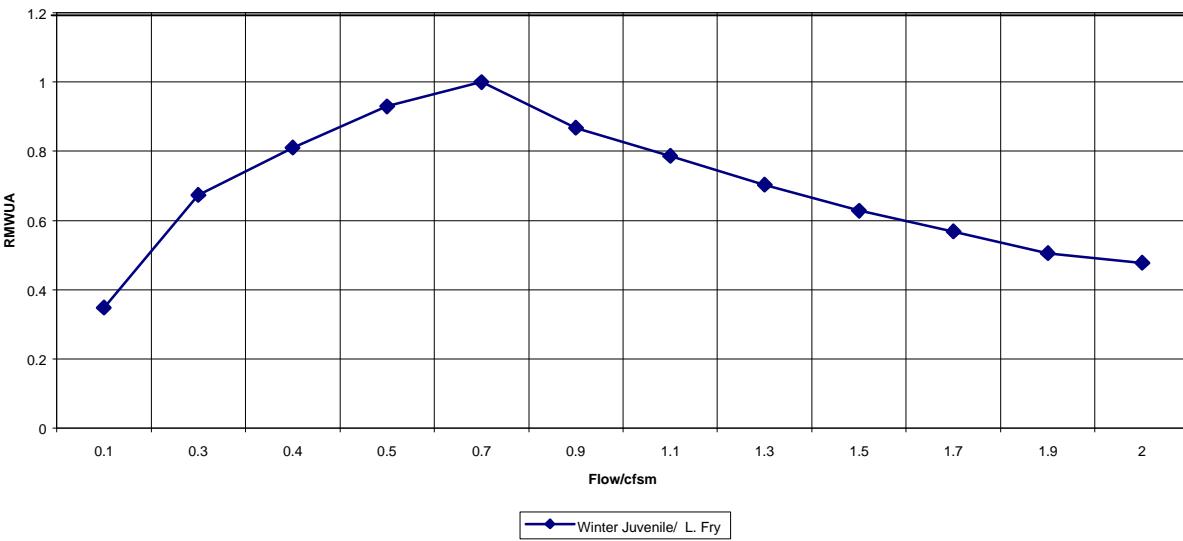
<i>Winter</i>	<i>Autumn</i>	<i>Summer</i>	<i>Spring</i>
Juvenile/ L. Fry	Juvenile/ L. Fry/ Spawn	Juvenile/ L. Fry/ New Fry	Juvenile/ L. Fry/ New Fry
0.246178	0.179249	0.23327	0.347695
0.476771	0.363077	0.472499	0.673378
0.573775	0.458413	0.596568	0.810383
0.658413	0.57522	0.748578	0.929923
0.788198	0.775151	1	1
0.876298	0.910228	0.867829	0.867829
0.932301		1	0.786518
0.966535	0.98151	0.703437	0.703437
0.986979	0.929204	0.62857	0.62857
0.994786	0.875803	0.567981	0.567981
	1	0.825606	0.50537
0.999587	0.80052	0.477003	0.477003

1 0.921412 0.70803 0.70803

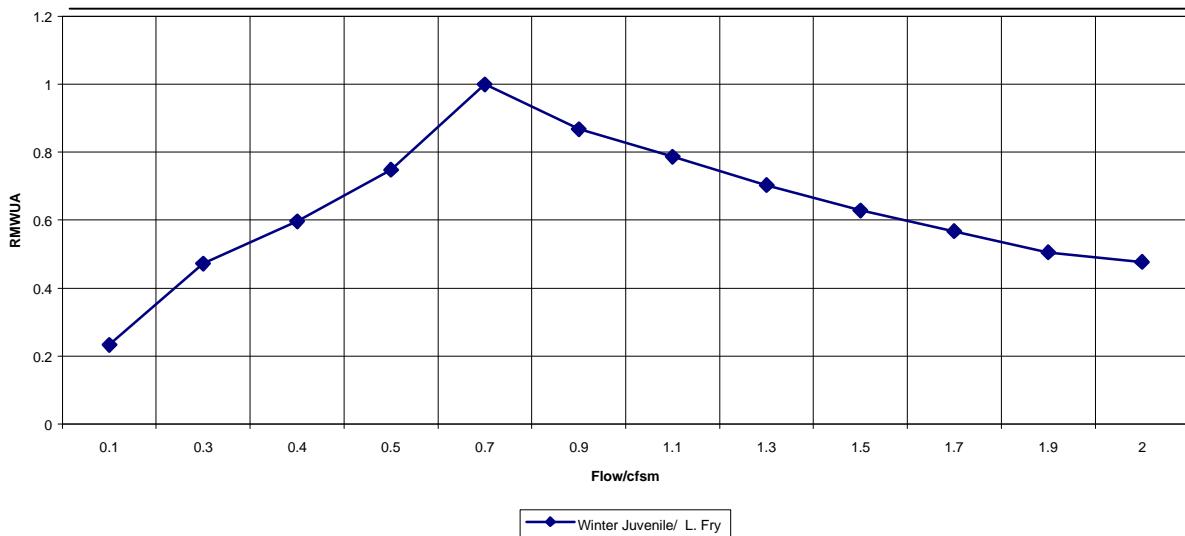
Saco River: Winter Curve : Salmon : Juvenile/ L.Fry



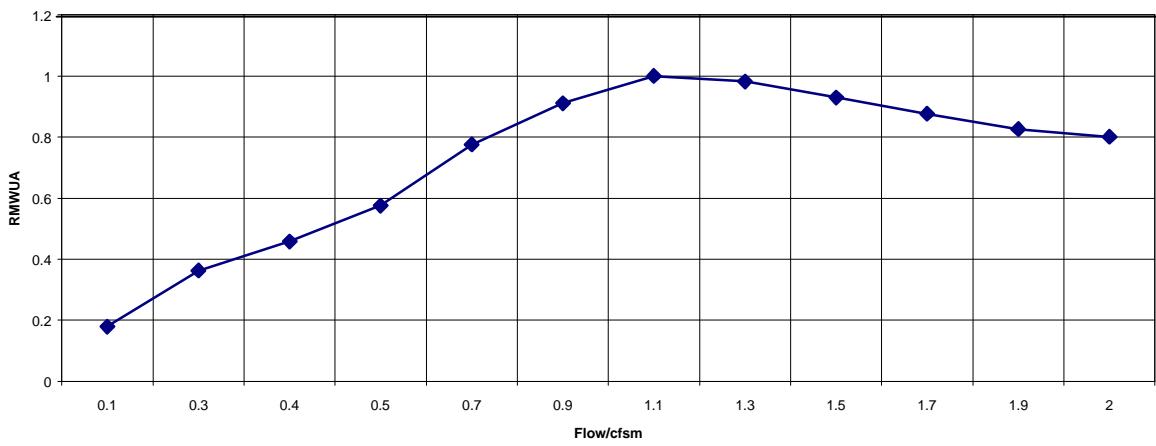
Saco River : Spring : Salmon : Juvenile/E.Fry/L.Fry



Saco River : Summer : Salmon : Juvenile/ L.Fry/E.Fry/Spawning



Autumn RMWUA for Saco River/Salmon/ Juvenile, Spawning, L. Fry



—●— Renormalized WUA

Saco River Site - Longnose Dace

Wt. Usable Area				
Flow/cfsm	Adult	Juvenile	Spawning	Fry
0.1	9415	9554	2774	11428
0.3	24000	22177	11246	21562
0.4	30490	26944	16000	25004
0.5	36062	30446	20534	27330
0.7	44184	34915	27929	29837
0.9	49042	36713	32692	30483
1.1	51876	37021	35463	30196
1.3	53038	36232	36914	29229
1.5	53122	34794	37445	27970
1.7	52412	32897	37136	26377
1.9	51593	31390	36808	25148
2	51054	30492	36399	24448

Maximum : 53122 37021 37445 30483

	Minimum Normalized Wt.ed Usable Area			
Flow/cfsm	Adult/ Juvenile/ Fry	Adult/ Juvenile/ Spawning	Adult/ Juvenile	Adult/ Juvenile/ Fry/ Spawn
0.1	0.177234	0.074082	0.177234	0.074082
0.3	0.45179	0.300334	0.45179	0.300334
0.4	0.573962	0.427293	0.573962	0.427293
0.5	0.678852	0.548378	0.678852	0.548378
0.7	0.831746	0.745867	0.831746	0.745867
0.9	0.923196	0.873067	0.923196	0.873067
1.1	0.976545	0.947069	0.976545	0.947069
1.3	0.958862	0.978688	0.978688	0.958862
1.5	0.917561	0.939845	0.939845	0.917561
1.7	0.865302	0.888604	0.888604	0.865302
1.9	0.824984	0.847897	0.847897	0.824984
2	0.802021	0.823641	0.823641	0.802021

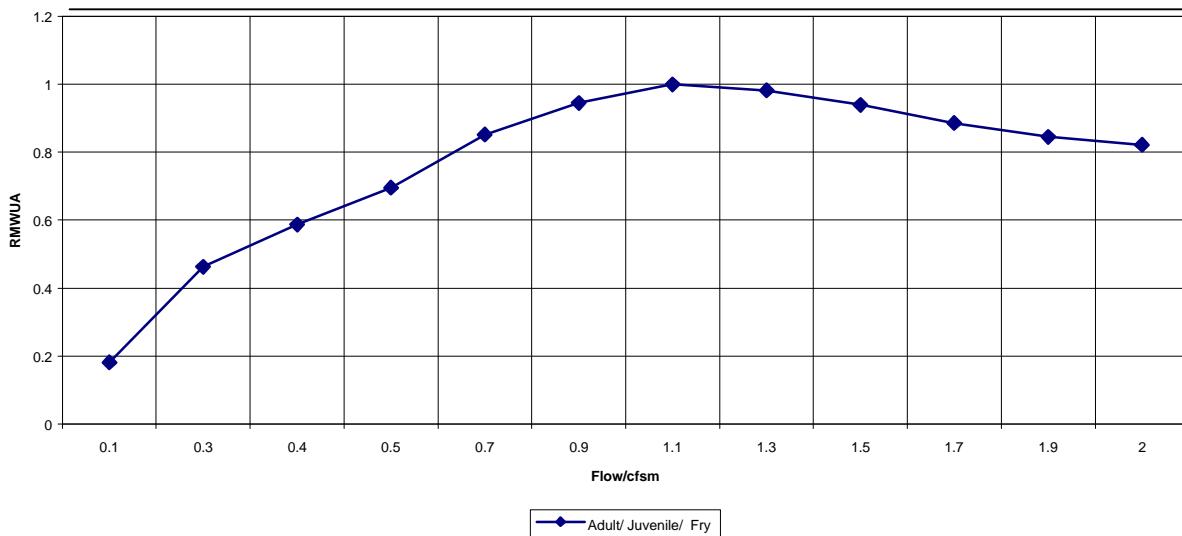
0.976545 0.978688 0.978688 0.958862

Normalized Wt.ed Usable Area				
Adult	Juvenile	Spawning	Fry	
0.177234	0.25807	0.074082	0.374897	
0.45179	0.599038	0.300334	0.707345	
0.573962	0.727803	0.427293	0.82026	
0.678852	0.822398	0.548378	0.896565	
0.831746	0.943113	0.745867	0.978808	
0.923196	0.99168	0.873067		1
0.976545		1	0.947069	0.990585
0.998419	0.978688	0.985819	0.958862	
	1	0.939845		0.917561
0.986635	0.888604	0.991748	0.865302	
0.971217	0.847897	0.982988	0.824984	
0.961071	0.823641	0.972066	0.802021	

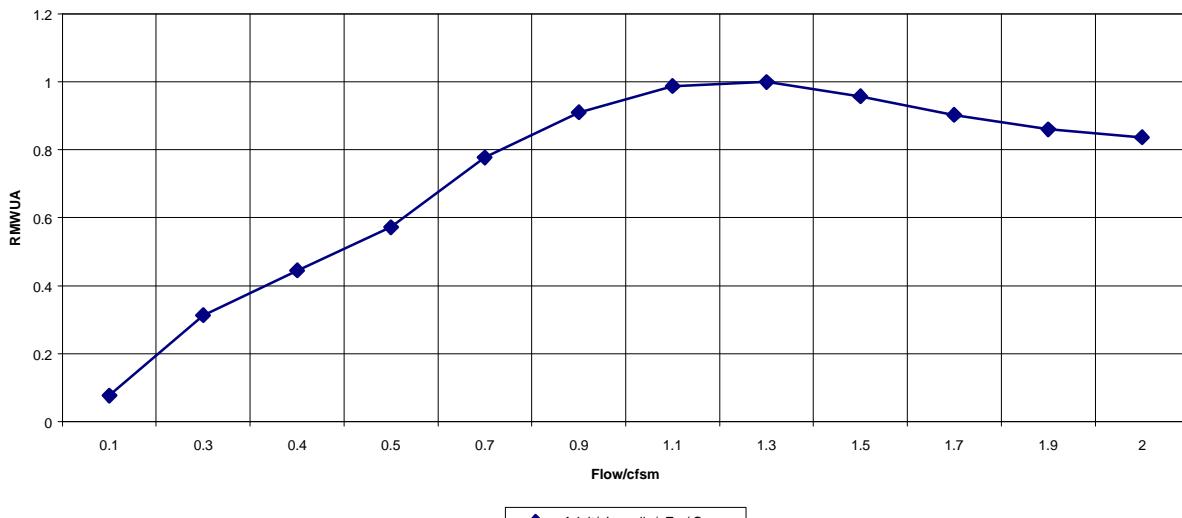
Spring *Summer*
Autumn
Winter

Renormalized Minimum Wt.ed		Usable Area	
Adult/ Juvenile/ Fry	Adult/ Juvenile/ Spawning	Adult/ Juvenile	Adult/ Juvenile/ Fry/ Spawn
0.18149	0.075695	0.181093	0.07726
0.462642	0.306874	0.461629	0.313219
0.587748	0.436598	0.586461	0.445625
0.695158	0.560319	0.693635	0.571904
0.851723	0.76211	0.849858	0.777867
0.94537	0.892079	0.943299	0.910524
1	0.967693	0.99781	0.987701
0.981893		1	1
0.939599	0.960311	0.960311	0.956926
0.886085	0.907954	0.907954	0.902426
0.84448	0.866361	0.866361	0.860378
0.821284	0.841577	0.841577	0.83643

Saco River : Winter/Spring/Autumn : Longnose Dace, Adult/Juvenile/ Fry



Saco River: Longnose Dace ; Summer: Adult/Juvenile/Fry/Spawning



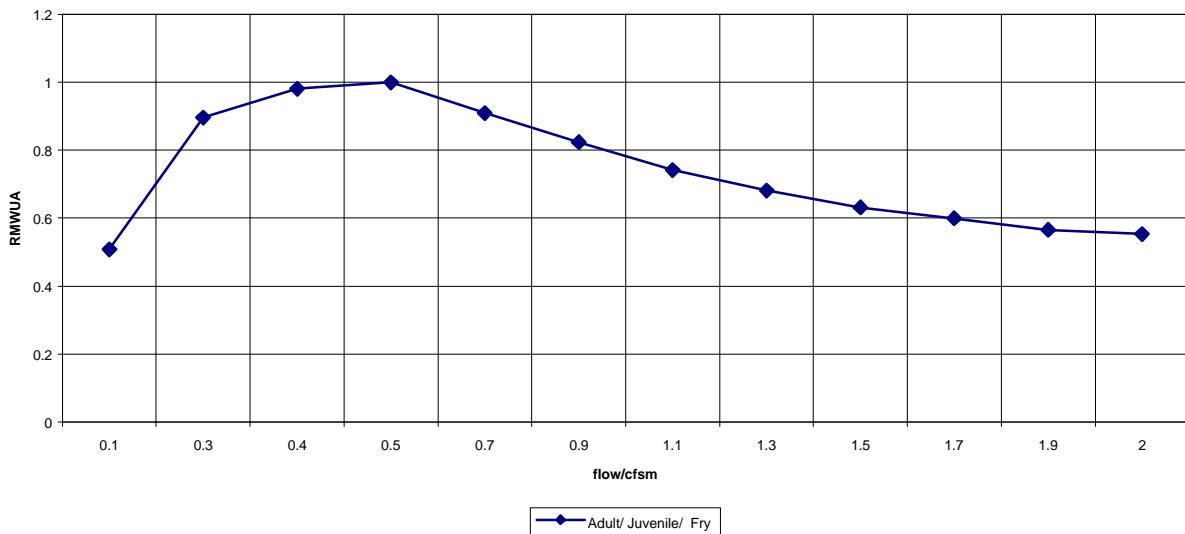
Saco River Site - White Sucker

Wt. Usable Area			Normalized Wt.ed Usable Area		
	Juvenile & Adult	Fry	Juvenile	& Adult	Fry
Flow/cfsm					
0.1	9369	28770	0.489192	0.489192	0.810126
0.3	16524	35513	0.862782	0.862782	1
0.4	18078	35271	0.943922	0.943922	0.993186
0.5	18875	34186	0.985537	0.985537	0.962633
0.7	19152	31093	1	1	0.875539
0.9	18579	28145	0.970081	0.970081	0.792527
1.1	17696	25338	0.923977	0.923977	0.713485
1.3	16743	23291	0.874217	0.874217	0.655844
1.5	15847	21601	0.827433	0.827433	0.608256
1.7	15115	20481	0.789213	0.789213	0.576718
1.9	14297	19353	0.746502	0.746502	0.544955
2	13958	18935	0.728801	0.728801	0.533185

Maximum : 19152 35513

Minimum Normalized Wt.ed Usable Area			Renormalized Minimum Wt.ed Usable Area		
Flow/cfsm	Adult/ Juvenile/ Fry/	Adult/ Juvenile/ Fry/	Adult/ Juvenile/ Fry/	Adult/ Juvenile/ Fry/	Adult/ Juvenile/ Fry/
0.1	0.489192	0.489192	0.508181	0.489192	10
0.3	0.862782	0.862782	0.896273	0.862782	30
0.4	0.943922	0.943922	0.980563	0.943922	40
0.5	0.962633	0.985537	1	0.985537	50
0.7	0.875539	1	0.909524	1	70
0.9	0.792527	0.970081	0.82329	0.970081	90
1.1	0.713485	0.923977	0.741181	0.923977	110
1.3	0.655844	0.874217	0.681302	0.874217	130
1.5	0.608256	0.827433	0.631867	0.827433	150
1.7	0.576718	0.789213	0.599105	0.789213	170
1.9	0.544955	0.746502	0.566109	0.746502	190
2	0.533185	0.728801	0.553882	0.728801	200

Saco River, White Sucker, Winter/Spring/Summer/Autumn Curve



Section 4

Mt. Attatash/Saco River Site - Summary of Results for each Season

WINTER

	Brown Trout	Rainbow Trout	Salmon Sucker	White Dace	Longnose
Flow/cfs					
10	0.1056052	0.000224	0.246178	0.508181	0.18149
30	0.27301652	0.009164	0.476771	0.896273	0.462642
40	0.37598159	0.029951	0.573775	0.980563	0.587748
50	0.48571622	0.06169	0.658413	1	0.695158
70	0.66450041	0.122932	0.788198	0.909524	0.851723
90	0.79061738	0.276486	0.876298	0.82329	0.94537
110	0.88769293	0.541574	0.932301	0.741181	1
130	0.95721636	0.796603	0.966535	0.681302	0.981893
150	1	0.932275	0.986979	0.631867	0.939599
170	0.99461965	1	0.994786	0.599105	0.886085
190	0.97375399	0.997851	1	0.566109	0.8448
200	0.96360124	0.982754	0.999587	0.553882	0.821284

Maximum : 1 1 1 1 1

Winter Q50 =

or

93.5 interpolated WUA's at Q50 for each species

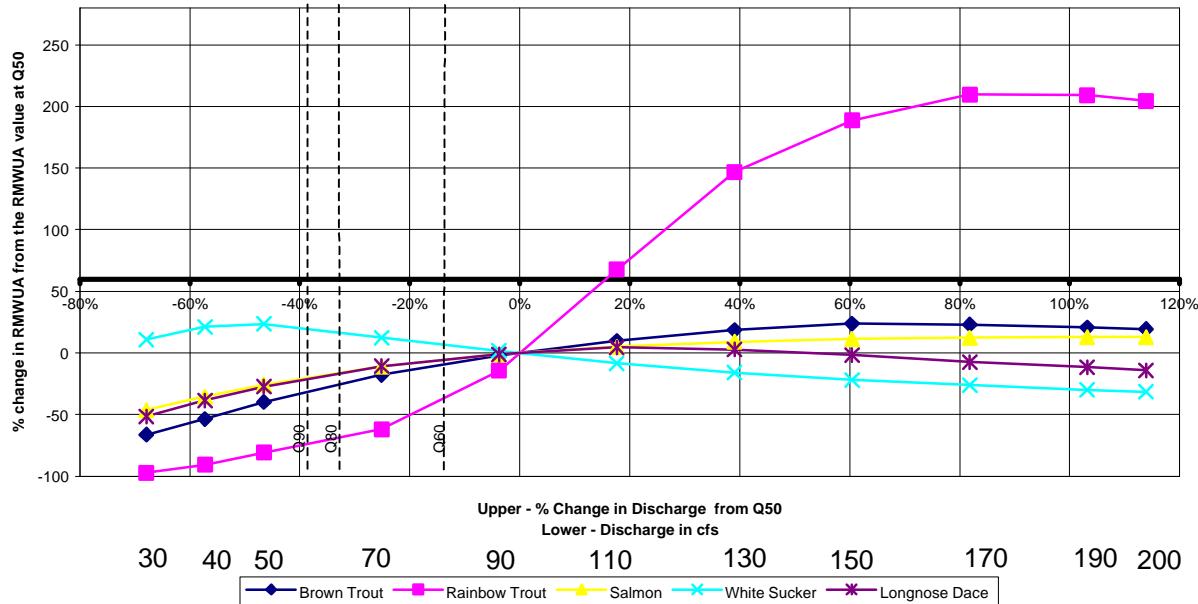
	Brown Trout	Rainbow Trout	Salmon Sucker	White Dace	Longnose
	0.807606	0.322877	0.886099	0.808921	0.95493

At the given Q reduced for Q50, this is the corresponding

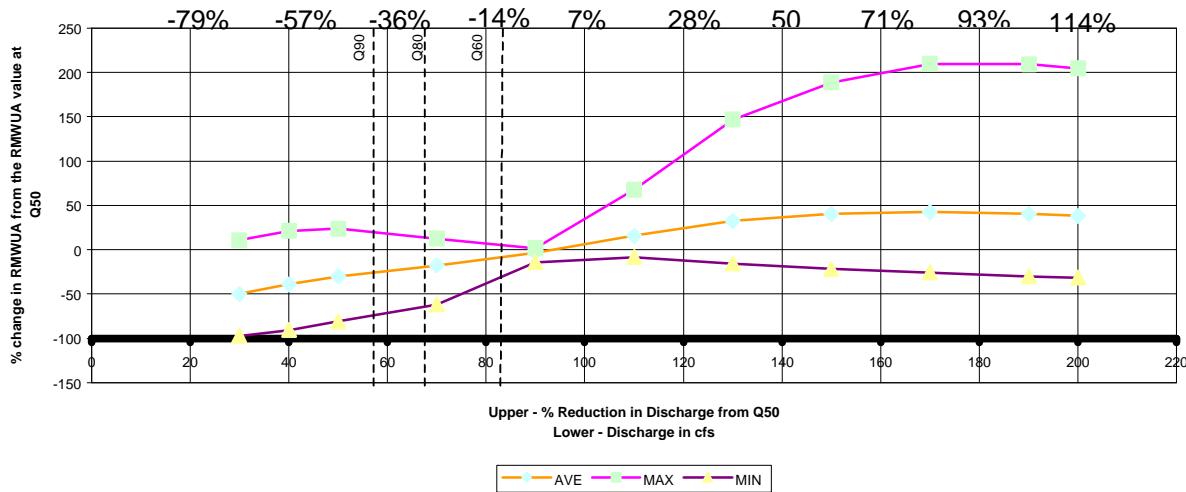
% change in WUA from WUA@Q50 for the species

Flow/cfs	Q50 reduced by this %						AVE using all species	MAX	MIN
		Brown Trout	Rainbow Trout	Salmon Sucker	White Dace	Longnose			
30	-67.91%	-66.1943	-97.1617	-46.1943	10.79853	-51.5523	-50.0608	10.79853	-97.1617
40	-57.22%	-53.4449	-90.7238	-35.247	21.21858	-38.4512	-39.3297	21.21858	-90.7238
50	-46.52%	-39.8573	-80.8937	-25.6953	23.62146	-27.2033	-30.0056	23.62146	-80.8937
70	-25.13%	-17.7197	-61.9259	-11.0485	12.43673	-10.8078	-17.813	12.43673	-61.9259
90	-3.74%	-2.10353	-14.3678	-1.10603	1.77634	-1.00115	-3.36043	1.77634	-14.3678
110	17.65%	9.916638	67.7339	5.214121	-8.37417	4.719715	15.84204	67.7339	-8.37417
130	39.04%	18.52522	146.7204	9.077594	-15.7764	2.82356	32.27408	146.7204	-15.7764
150	60.43%	23.82282	188.7404	11.38474	-21.8877	-1.60543	40.09097	188.7404	-21.8877
170	81.82%	23.15661	209.7158	12.2658	-25.9378	-7.20938	42.39822	209.7158	-25.9378
190	103.21%	20.57296	209.0502	12.85425	-30.0168	-11.5328	40.18556	209.0502	-30.0168
200	113.90%	19.31582	204.3744	12.80762	-31.5283	-13.9953	38.19484	204.3744	-31.5283

Saco River/Winter Season/ All Species
Winter Q50 = 93.5, Q60 = 83.1, Q80 = 66.2, Q90 = 57.1 cfs



Saco River/Winter Season/ All Species
Winter Q50 = 93.5, Q60 = 83.1, Q80 = 66.2, Q90 = 57.1 cfs



Mt. Attatash/Saco River Site - Summary of Results for each Season

SUMMER

Flow/cfs	Brown Trout	Rainbow Trout	Salmon	White Sucker	Longnose Dace
10	0.243812	0.249853	0.23327	0.508181	0.07726
30	0.586473	0.509853	0.472499	0.896273	0.313219
40	0.717581	0.617448	0.596568	0.980563	0.445625
50	0.743367	0.71158	0.748578	1	0.571904
70	0.848619	0.872287		1	0.909524
90	0.924239		1	0.867829	0.82329
110	0.977533	0.922768	0.786518	0.741181	0.987701
130		1	0.851612	0.703437	0.681302
150	0.996342	0.790931	0.62857	0.631867	0.956926
170	0.979178	0.747181	0.567981	0.599105	0.902426
190	0.958636	0.698465	0.50537	0.566109	0.860378
200	0.948641	0.679051	0.477003	0.553882	0.83643

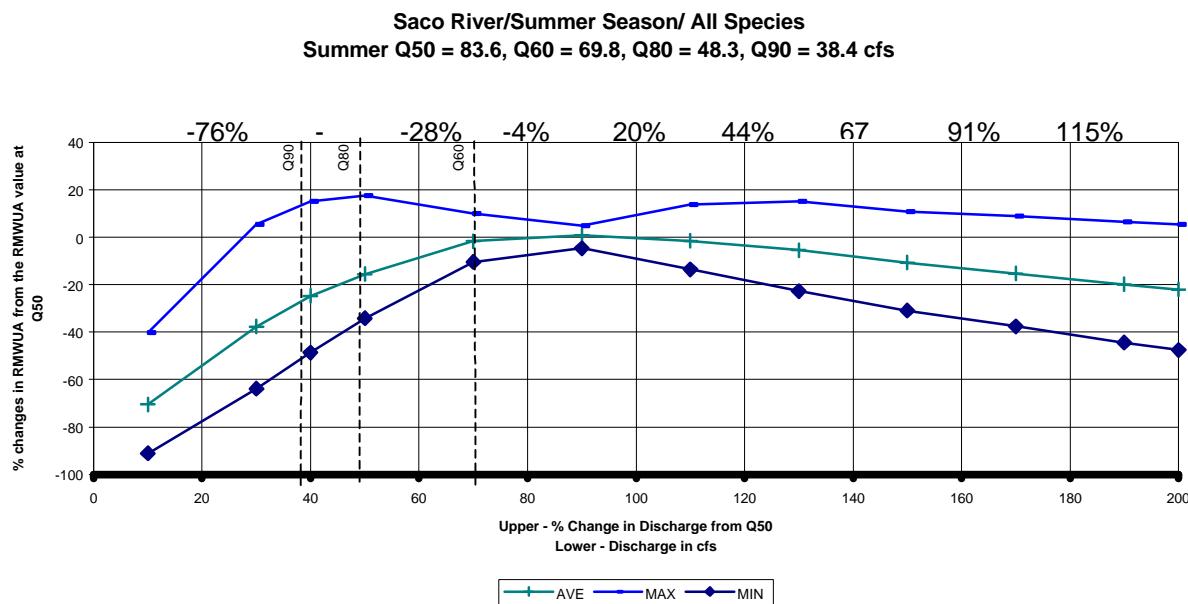
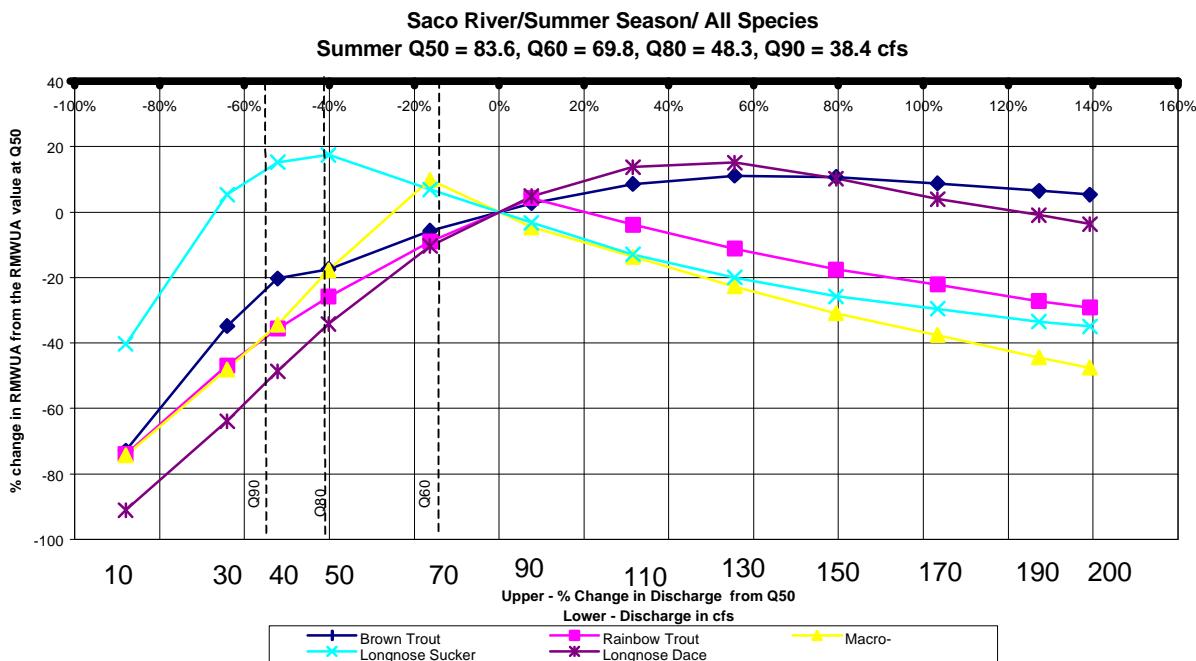
Maximum : 1 1 1 1

Summer Q50 = 83.6 interpolated WUA's at Q50 for each species

Brown Trout	Rainbow Trout	Salmon	White Sucker	Longnose Dace
0.90004	0.959132	0.910124	0.850885	0.868074

At the given Q reduced for Q50, this is the corresponding
% change in WUA from WUA@Q50 for the species

Flow/cfs	Q50 reduced by this %	Brown	Rainbow	Macro-	Longnose	Longnose	AVE using all species	MAX	MIN
		Trout	Trout	Invert.s	Sucker	Dace			
10	-88%	-72.911	-73.9501	-74.3695	-40.2762	-91.0998	-70.5213	-40.2762	-91.0998
30	-64%	-34.8393	-46.8423	-48.0841	5.334146	-63.9179	-37.6699	5.334146	-63.9179
40	-52%	-20.2723	-35.6242	-34.452	15.2403	-48.665	-24.7547	15.2403	-48.665
50	-40%	-17.4074	-25.81	-17.7499	17.52467	-34.118	-15.5121	17.52467	-34.118
70	-16%	-5.7132	-9.05456	9.875158	6.891554	-10.3916	-1.67853	9.875158	-10.3916
90	8%	2.688564	4.260969	-4.64713	-3.24308	4.890169	0.789897	4.890169	-4.64713
110	32%	8.609927	-3.79128	-13.5813	-12.893	13.78074	-1.57497	13.78074	-13.5813
130	56%	11.10613	-11.2101	-22.7098	-19.9302	15.19759	-5.50925	15.19759	-22.7098
150	79%	10.69972	-17.5367	-30.9358	-25.7401	10.2356	-10.6555	10.69972	-30.9358
170	103%	8.792693	-22.0981	-37.593	-29.5904	3.95726	-15.3063	8.792693	-37.593
190	127%	6.510382	-27.1774	-44.4724	-33.4682	-0.88649	-19.8988	6.510382	-44.4724
200	139%	5.399862	-29.2015	-47.5892	-34.9052	-3.64533	-21.9883	5.399862	-47.5892



Mt. Attatash/Saco River Site - Summary of Results for each Season

Autumn

	Brown Trout	Rainbow Trout	Salmon Sucker	White Dace	Longnose
Flow/cfs					
10	0.105605	0.000224	0.179249	0.508181	0.18149
30	0.273017	0.009164	0.363077	0.896273	0.462642
40	0.375982	0.029951	0.458413	0.980563	0.587748
50	0.485716	0.06169	0.57522	1	0.695158
70	0.6645	0.122932	0.775151	0.909524	0.851723
90	0.790617	0.276486	0.910228	0.82329	0.94537
110	0.887693	0.541574	1	0.741181	1
130	0.957216	0.796603	0.98151	0.681302	0.981893
150	1	0.932275	0.929204	0.631867	0.939599
170	0.99462	1	0.875803	0.599105	0.886085
190	0.973754	0.997851	0.825606	0.566109	0.8448
200	0.963601	0.982754	0.80052	0.553882	0.821284

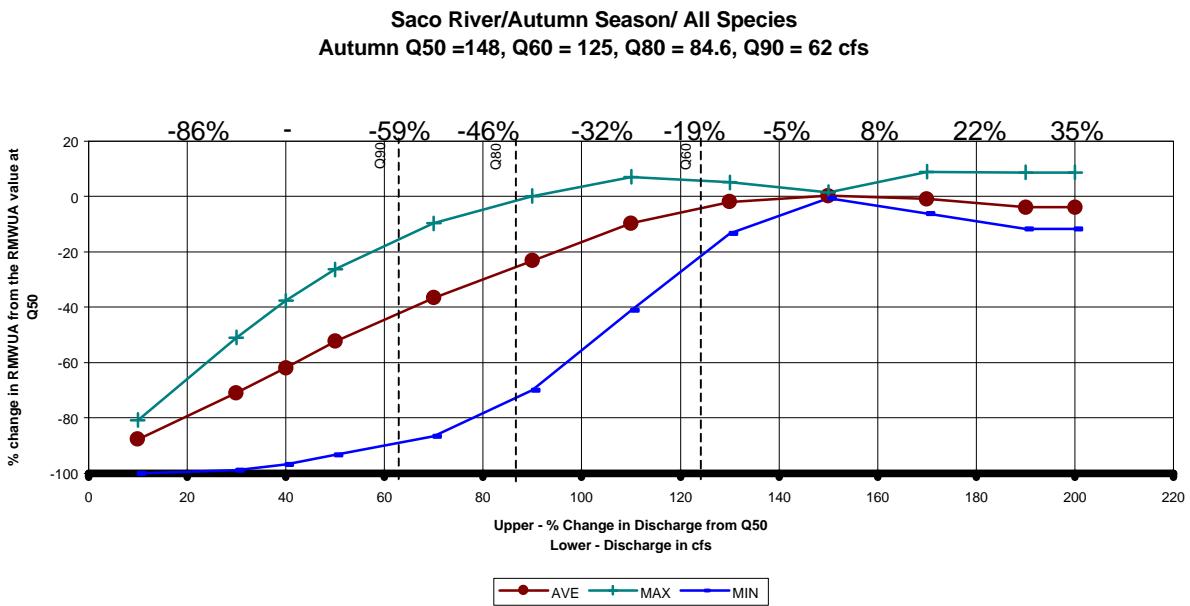
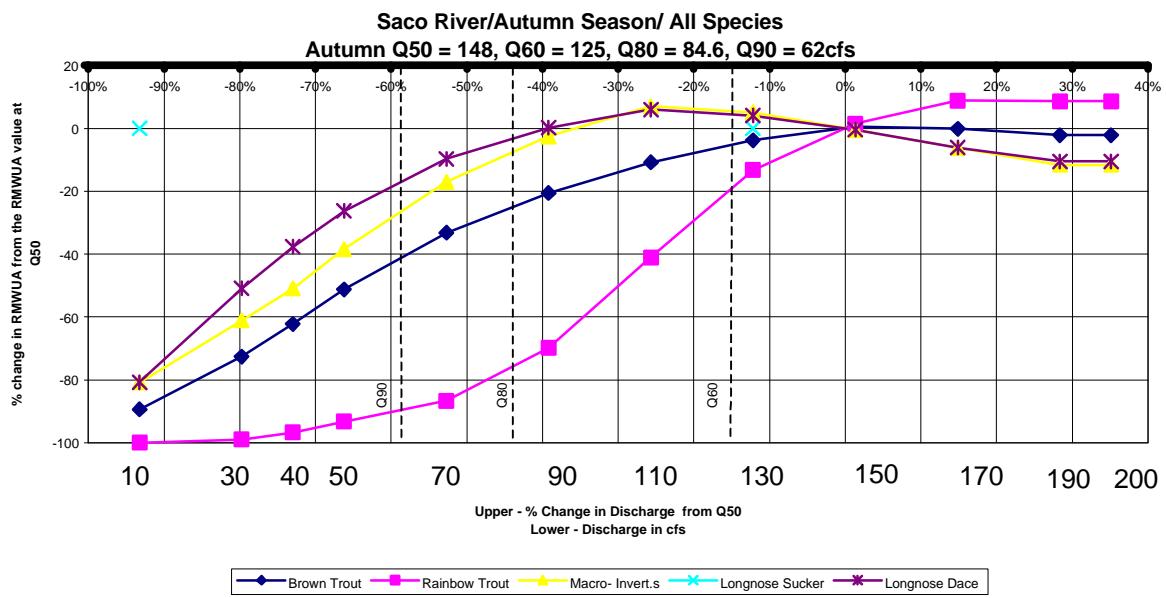
Maximum : 1 1 1 1 1

Autumn Q50 = 148 interpolated WUA's at Q50 for each species

Brown Trout	Rainbow Trout	Macro- Invert.s	Longnose Sucker	Longnose Dace
0.995722	0.918708	0.934434	0.63681	0.943829

At the given Q reduced for Q50, this is the corresponding
% change in WUA from WUA@Q50 for the species

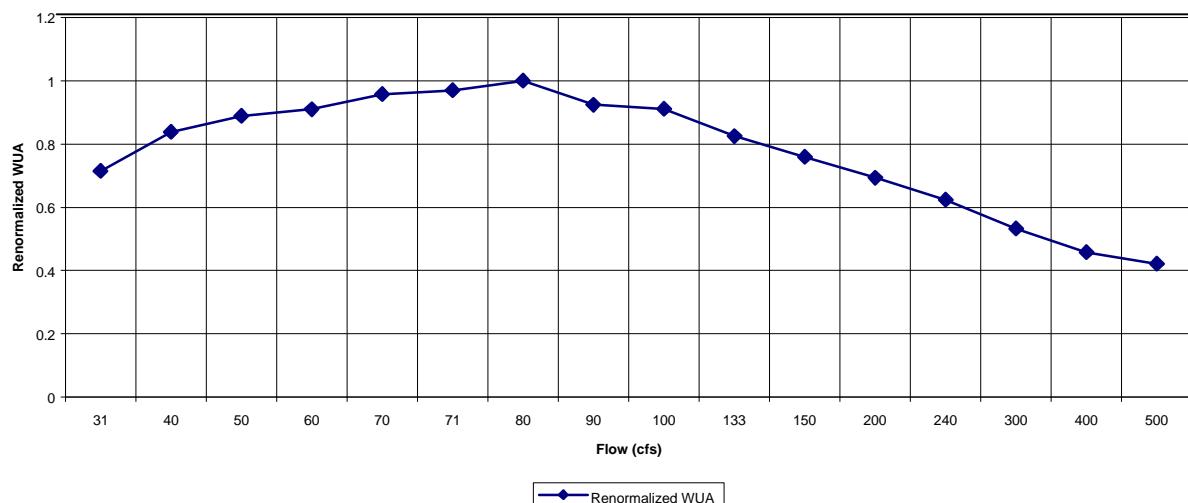
Flow/cfs	Q50 reduced by this %	Brown	Rainbow	Macro-	Longnose	Longnose	AVE using all species	MAX	MIN
		Trout	Trout	Invert.s	Sucker	Dace			
10	-93%	-89.3941	-99.9757	-80.8174		-80.7708	-87.7395	-80.7708	-99.9757
30	-80%	-72.581	-99.0025	-61.1447		-50.9825	-70.9277	-50.9825	-99.0025
40	-73%	-62.2403	-96.7399	-50.9421		-37.7273	-61.9124	-37.7273	-96.7399
50	-66%	-51.2197	-93.2852	-38.4419		-26.347	-52.3234	-26.347	-93.2852
70	-53%	-33.2644	-86.619	-17.0459		-9.75869	-36.672	-9.75869	-86.619
90	-39%	-20.5986	-69.9049	-2.59047		0.163274	-23.2327	0.163274	-69.9049
110	-26%	-10.8493	-41.0505	7.016626		5.95143	-9.73294	7.016626	-41.0505
130	-12%	-3.86707	-13.291	5.037941		4.032973	-2.02179	5.037941	-13.291
150	1%	0.429675	1.476778	-0.55977		-0.44811	0.224643	1.476778	-0.55977
170	15%	-0.11067	8.848503	-6.27457		-6.11797	-0.91368	8.848503	-6.27457
190	28%	-2.2062	8.614573	-11.6465		-10.4923	-3.9326	8.614573	-11.6465
200	35%	-2.2062	8.614573	-11.6465		-10.4923	-3.9326	8.614573	-11.6465



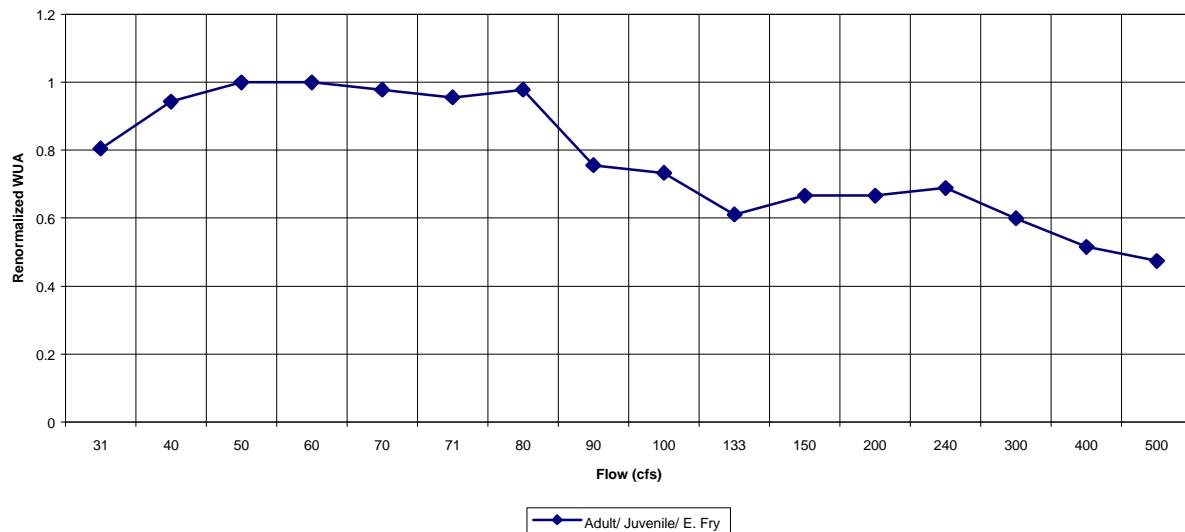
Section 5

Flow/cfs	Wt. Usable Area			Normalized Wt.ed Usable Area							
	Adult	Juvenile	Spawning	L. Fry	E. Fry	Adult	Juvenile	Spawning	L. Fry	E. Fry	
31	1625000	2200000	597500	3590000	280000	0.722222	0.926316	0.603535	1	0.933333	
40	1955000	2280000	700000	3550000	245000	0.868889	0.96	0.707071	0.988858	0.816667	
50	2200000	2335000	742500	3352500	227500	0.977778	0.983158	0.75	0.933844	0.758333	
60	2250000	2375000	760000	3270000	225000	1	1	0.767677	0.910864	0.75	
70	2247500	2350000	800000	3195000	220000	0.998889	0.989474	0.808081	0.889972	0.733333	
71	2247000	2340000	810000	3180000	215000	0.998667	0.985263	0.818182	0.885794	0.716667	
80	2240000	2280000	850000	3030000	220000	0.995556	0.96	0.858586	0.844011	0.733333	
90	2162500	2262500	900000	2800000	170000	0.961111	0.952632	0.909091	0.779944	0.566667	
100	2012500	2242500	950000	2760000	165000	0.894444	0.944211	0.959596	0.768802	0.55	
133	1870000	2050000	990000	2500000	137500	0.831111	0.863158	1	0.696379	0.458333	
150	1725000	1865000	970000	2300000	150000	0.766667	0.785263	0.979798	0.640669	0.5	
200	1465000	1620000	960000	2100000	150000	0.651111	0.682105	0.969697	0.584958	0.5	
240	1255000	1400000	800000	1890000	155000	0.557778	0.589474	0.808081	0.526462	0.516667	
300	1012500	1225000	625000	1812500	300000	0.45	0.515789	0.631313	0.504875	1	
400	870000	1000000	425000	1760000	242500	0.386667	0.421053	0.429293	0.490251	0.808333	
500	800000	890000	375000	1730000	222500	0.355556	0.374737	0.378788	0.481894	0.741667	
Maximum :	2250000	2375000	990000	3590000	300000						
Flow/cfs	Minimum Normalized Wt.ed Usable Area			Renormalized Minimum Wt.ed Usable Area				<i>NHWSpA</i>		<i>NHSu</i>	
	Adult/ Juvenile/ L. Fry	Adult/ Juvenile/ Spawning	Adult/ Juvenile/ E. Fry	Adult/ Juvenile/ E. Fry	Adult/ Juvenile/ L. Fry	Adult/ Juvenile/ Spawning	Adult/ Juvenile/ L. Fry	Adult/ Juvenile/ E. Fry	Adult/ Juvenile/ E. Fry	Adult/ Juvenile/ L. Fry	Adult/ Juvenile/ E. Fry
		Spawn	L. Fry	L. Fry	Spawn	L. Fry	Spawn	L. Fry	L. Fry	Spawn	L. Fry
			Spawning			Spawning					Spawning
31	0.722222	0.603535		0.603535	0.603535	0.722222	0.773386	0.663889	0.71508	0.804714	0.884354
40	0.868889	0.707071		0.707071	0.707071	0.816667	0.930443	0.777778	0.83775	0.942761	1
50	0.933844	0.75		0.75	0.75	0.758333	1	0.825	0.888614	1	0.928571
60	0.910864	0.767677		0.767677	0.75	0.75	0.975391	0.844444	0.909558	1	0.918367
70	0.889972	0.808081		0.808081	0.733333	0.733333	0.95302	0.888889	0.957429	0.977778	0.897959
71	0.885794	0.818182		0.818182	0.716667	0.716667	0.948546	0.9	0.969397	0.955556	0.877551
80	0.844011	0.858586		0.844011	0.733333	0.733333	0.903803	0.944444	1	0.977778	0.897959
90	0.779944	0.909091		0.779944	0.566667	0.566667	0.835198	1	0.924092	0.755556	0.693878
100	0.768802	0.894444		0.768802	0.55	0.55	0.823266	0.983889	0.910891	0.733333	0.673469
133	0.696379	0.831111		0.696379	0.458333	0.458333	0.745712	0.914222	0.825083	0.611111	0.561224
150	0.640669	0.766667		0.640669	0.5	0.5	0.686055	0.843333	0.759076	0.666667	0.612245
200	0.584958	0.651111		0.584958	0.5	0.5	0.626398	0.716222	0.693069	0.666667	0.612245
240	0.526462	0.557778		0.526462	0.516667	0.516667	0.563758	0.613556	0.623762	0.688889	0.632653
300	0.45	0.45		0.45	0.45	0.45	0.481879	0.495	0.533168	0.6	0.55102
400	0.386667	0.386667		0.386667	0.386667	0.386667	0.414059	0.425333	0.45813	0.515556	0.473469
500	0.355556	0.355556		0.355556	0.355556	0.355556	0.380744	0.391111	0.421269	0.474074	0.435374

**Brown Trout RMWUA for Little River/ Using Adult, Juvenile, Spawning, Late Fry, but excluding
Early Fry. Winter/Spring/Autumn Curve**



Brown Trout RUWUA, using : Adult/ Juvenile/ E.Fry/L.Fry/Spawning. Summer Curve



Waterbury/Little River Site - Rainbow

Flow/cfs	Wt. Usable Area				Normalized Wt.ed Usable Area			
	Adult	Juvenile	Spawning	Fry	Adult	Juvenile	Spawning	Fry
31	1400000	1150000	125000	2575000	0.5	0.787671	0.085911	0.971698
40	1685000	1250000	250000	2650000	0.601786	0.856164	0.171821	1
50	1900000	1350000	400000	2575000	0.678571	0.924658	0.274914	0.971698
60	2050000	1400000	555000	2480000	0.732143	0.958904	0.381443	0.935849
70	2180000	1435000	605000	2360000	0.778571	0.982877	0.415808	0.890566
71	2185000	1440000	712500	2350000	0.780357	0.986301	0.489691	0.886792
80	2275000	1450000	775000	2275000	0.8125	0.993151	0.532646	0.858491
90	2350000	1460000	910000	2075000	0.839286	1	0.62543	0.783019
100	2375000	1440000	990000	1950000	0.848214	0.986301	0.680412	0.735849
133	2800000	1275000	1170000	1625000	1	0.873288	0.804124	0.613208
150	2235000	1150000	1300000	1385000	0.798214	0.787671	0.893471	0.522642
200	1925000	900000	1440000	1050000	0.6875	0.616438	0.989691	0.396226
240	1500000	725000	1455000	940000	0.535714	0.496575	1	0.354717
300	1170000	520000	1300000	710000	0.417857	0.356164	0.893471	0.267925
400	760000	375000	725000	590000	0.271429	0.256849	0.498282	0.222642

500	665000	310000	310000	550000
Maximum :	2800000	1460000	1455000	2650000

0.2375	0.212329	0.213058	0.207547
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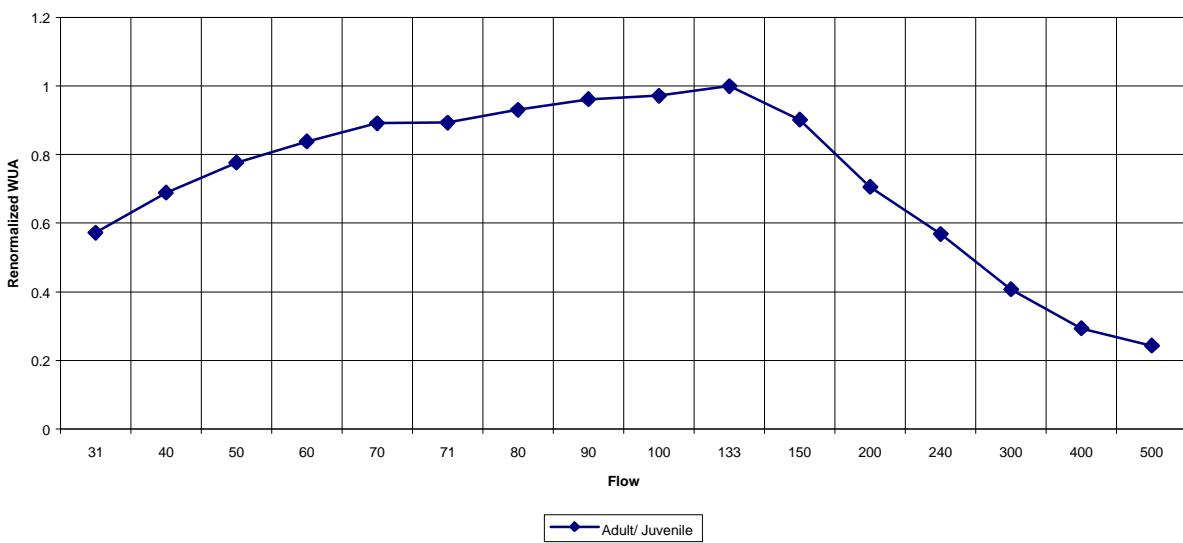
Minimum Normalized Wt.ed Usable Area				
Flow/cfs	Adult/ Juvenile/	Adult/ Juvenile/	Adult/ Juvenile	Adult/ Juvenile/
	Fry	Spawning	Fry/ Spawn	

31	0.5	0.085911	0.5	0.085911
40	0.601786	0.171821	0.601786	0.171821
50	0.678571	0.274914	0.678571	0.274914
60	0.732143	0.381443	0.732143	0.381443
70	0.778571	0.415808	0.778571	0.415808
71	0.780357	0.489691	0.780357	0.489691
80	0.8125	0.532646	0.8125	0.532646
90	0.783019	0.62543	0.839286	0.62543
100	0.735849	0.680412	0.848214	0.680412
133	0.613208	0.804124	0.873288	0.613208
150	0.522642	0.787671	0.787671	0.522642
200	0.396226	0.616438	0.616438	0.396226
240	0.354717	0.496575	0.496575	0.354717
300	0.267925	0.356164	0.356164	0.267925
400	0.222642	0.256849	0.256849	0.222642
500	0.207547	0.212329	0.212329	0.207547
	0.8125	0.804124	0.873288	0.680412

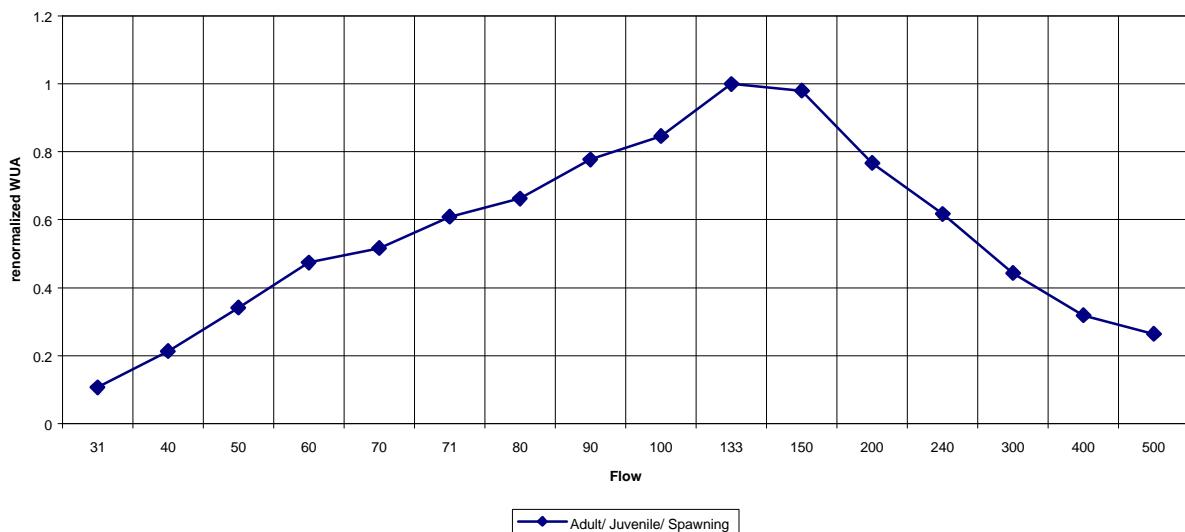
Renormalized Minimum Wt.ed Usable Area				
Flow/cfs	Adult/ Juvenile/	Adult/ Juvenile/	Adult/ Juvenile	Adult/ Juvenile/
	Fry	Spawning	Fry/ Spawn	

0.615385	0.106838	0.572549	0.126263
0.740659	0.213675	0.689104	0.252525
0.835165	0.34188	0.777031	0.40404
0.901099	0.474359	0.838375	0.560606
0.958242	0.517094	0.891541	0.611111
0.96044	0.608974	0.893585	0.719697
1	0.662393	0.930392	0.782828
0.963716	0.777778	0.961064	0.919192
0.90566	0.846154	0.971289	1
0.754717	1	1	0.901229
0.643251	0.97954	0.901961	0.768125
0.487663	0.766596	0.705882	0.582333
0.436575	0.617536	0.568627	0.521326
0.329753	0.442922	0.407843	0.393768
0.27402	0.319415	0.294118	0.327216
0.255443	0.26405	0.243137	0.305031

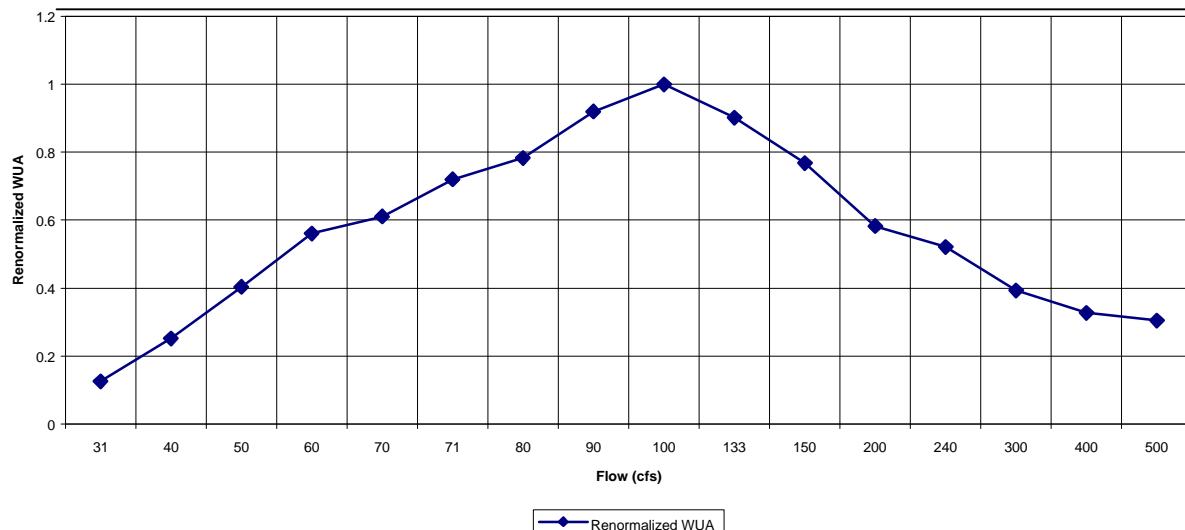
Winter and Autumn Curve for Little River, Rainbow Trout, Adult/Juvenile



Rainbow Trout : Little River, Spring Curve using : Adult/ Juvenile/ Spawning



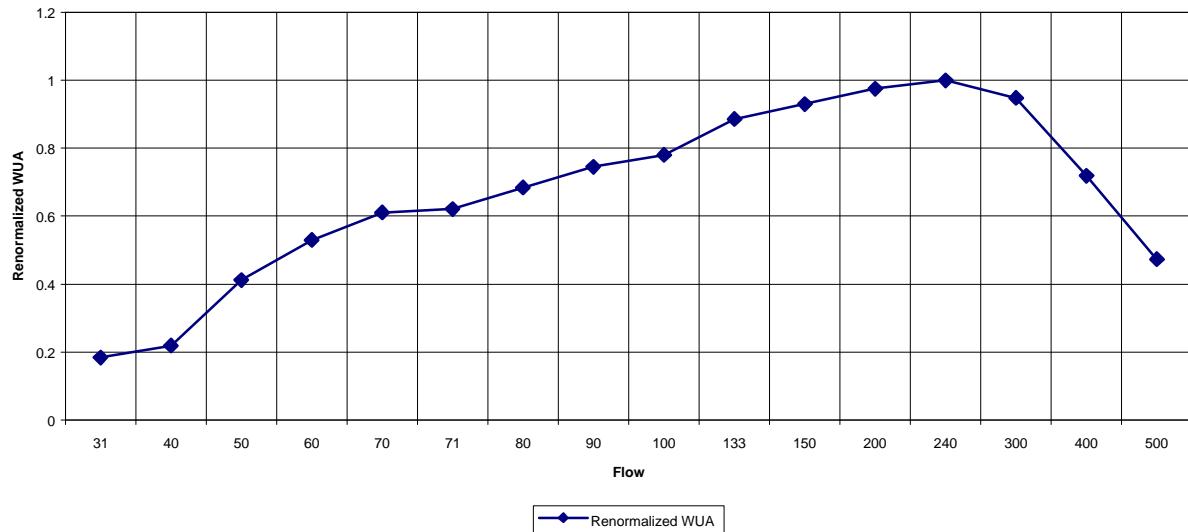
Rainbow Trout: Summer RMWUA for Little River, Using Adult/Juvenile/Spawning/Fry



Waterbury/Little River Site - Macroinvertebrates

Flow/cfs	Wt. Usable Area		Normalized Wt.ed Usable Area	
	Nose Vel.	Coln Vel.	Nose Vel.	Coln Vel.
31	1475000	525000	0.463836	0.184211
40	1765000	625000	0.555031	0.219298
50	2040000	1175000	0.641509	0.412281
60	2250000	1510000	0.707547	0.529825
70	2415000	1740000	0.759434	0.610526
71	2450000	1770000	0.77044	0.621053
80	2515000	1950000	0.790881	0.684211
90	2625000	2125000	0.825472	0.745614
100	2750000	2225000	0.86478	0.780702
133	2920000	2525000	0.918239	0.885965
150	2980000	2650000	0.937107	0.929825
200	3100000	2800000	0.974843	0.982456
240	3180000	2850000	1	1
300	3180000	2700000	1	0.947368
400	3025000	2050000	0.951258	0.719298
500	2910000	1350000	0.915094	0.473684
Maximum :	3180000	2850000		
Minimum Normalized Wt.ed Usable Area				
Nose Vel.		Renormalized Minimum Wt.ed Usable Area		
Coln Vel.		Nose Vel.		
Flow/cfs				
31	0.184211			0.184211
40	0.219298			0.219298
50	0.412281			0.412281
60	0.529825			0.529825
70	0.610526			0.610526
71	0.621053			0.621053
80	0.684211			0.684211
90	0.745614			0.745614
100	0.780702			0.780702
133	0.885965			0.885965
150	0.929825			0.929825
200	0.974843			0.974843
240	1			1
300	0.947368			0.947368
400	0.719298			0.719298
500	0.473684			0.473684
	1			

Macroinvertebrate Community-Nose and Mean-Column Velocities



Flow/cfs	Brown	Rainbow	Macro-	Longnose	Longnose
	Trout	Trout	Invert.s	Sucker	Dace
31	0.71508	0.572549	0.184211	N/A	0.481132
40	0.83775	0.689104	0.219298		0.936321
50	0.888614	0.777031	0.412281		1
60	0.909558	0.838375	0.529825		0.982242
70	0.957429	0.891541	0.610526		0.915649
71	0.969397	0.893585	0.621053		0.922309
80	1	0.930392	0.684211		0.874029
90	0.924092	0.961064	0.745614		0.832408
100	0.910891	0.971289	0.780702		0.779134
133	0.825083	1	0.885965		0.685905
150	0.759076	0.901961	0.929825		0.499445
200	0.693069	0.705882	0.974843		0.446171
240	0.623762	0.568627	1		0.333629
300	0.533168	0.407843	0.947368		0.249723
400	0.45813	0.294118	0.719298		0.199778
500	0.421269	0.243137	0.473684		0.18313

Maximum : 1 1 1 1 1

Autumn Q50 = 201 interpolated WUA's at Q50 for each species

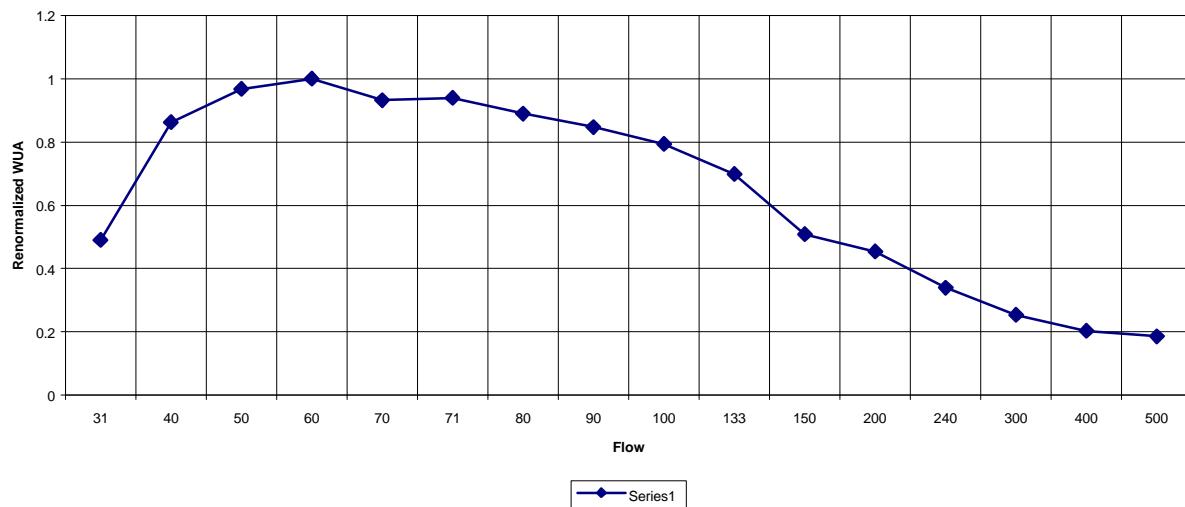
	Brown	Rainbow	Macro-	Longnose	Longnose
	Trout	Trout	Invert.s	Sucker	Dace
	0.691337	0.702451	0.975472	0	0.443357

At the given Q reduced for Q50, this is the corresponding

% change in WUA from WUA@Q50 for the species

Flow/cfs	Q50		% change in WUA from WUA@Q50 for the species					AVE	MAX	MIN
	reduced	by this %	Brown	Rainbow	Macro-	Longnose	Longnose			
31	84.57711		3.434392	-18.4927	-81.1157		8.520146	-21.9135	8.520146	-81.1157
40	80.0995		21.17837	-1.90011	-77.5187		111.1887	13.23706	111.1887	-77.5187
50	75.12438		28.53562	10.61709	-57.7352		125.5517	26.74228	125.5517	-57.7352
60	70.14925		31.56508	19.35001	-45.6853		121.5463	31.69403	121.5463	-45.6853
70	65.17413		38.48956	26.91855	-37.4122		106.5262	33.63054	106.5262	-37.4122
71	64.67662		40.22068	27.20965	-36.3331		108.0282	34.78137	108.0282	-36.3331
80	60.199		44.64733	32.44941	-29.8585		97.13867	36.09423	97.13867	-29.8585
90	55.22388		33.6675	36.81587	-23.5637		87.75112	33.66769	87.75112	-23.5637
100	50.24876		31.75797	38.27136	-19.9667		75.73505	31.44941	75.73505	-19.9667
133	33.83085		19.34598	42.35869	-9.17574		54.70692	26.80896	54.70692	-9.17574
150	25.37313		9.798305	28.40195	-4.67949		12.65067	11.54286	28.40195	-4.67949
200	0.497512		0.250627	0.488486	-0.06447		0.634599	0.327309	0.634599	-0.06447
240	-19.403		-9.77444	-19.0509	2.514507		-24.7494	-12.7651	2.514507	-24.7494
300	-49.2537		-22.8786	-41.94	-2.88099		-43.6747	-27.8436	-2.88099	-43.6747
400	-99.005		-33.7327	-58.1298	-26.2615		-54.9397	-43.2659	-26.2615	-58.1298
500	-148.756		-39.0646	-65.3873	-51.4405		-58.6948	-53.6468	-39.0646	-65.3873

Renormalized WUA for Adult/Juvenile/Fry/Spawn/Incubation for Longnose Dace - Summer Curve

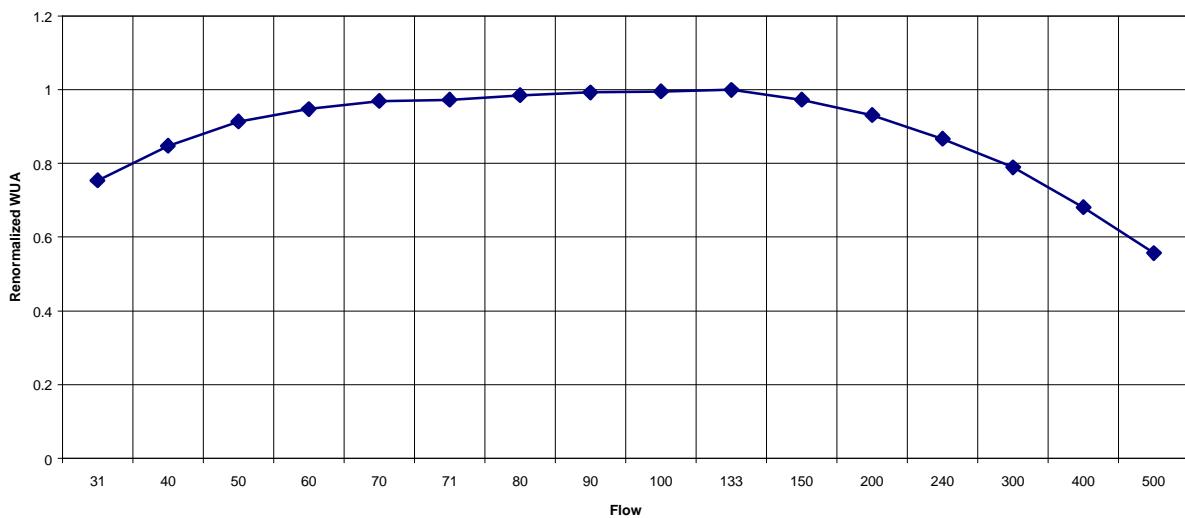


Waterbury/Little
River Site -
Longnose
Sucker

Flow/cfs	Wt. Usable Area		Normalized Wt.ed Usable Area
	Spwn/Inc.	Nose Vel.	
31	1210000	0.754364	
40	1360000	0.84788	
50	1466000	0.913965	
60	1520000	0.947631	
70	1554000	0.968828	
71	1560000	0.972569	
80	1580000	0.985037	
90	1592000	0.992519	
100	1596000	0.995012	
133	1604000	1	
150	1560000	0.972569	
200	1494000	0.931421	
240	1390000	0.866584	
300	1266000	0.789277	
400	1092000	0.680798	
500	894000	0.557357	
Maximum :	1604000		

Flow/cfs	Minimum Normalized Wt.ed Usable Area		Renormalized Minimum Wt.ed Usable Area
	Spawning\ Incubation	Spawning\ Incubation	
31	0.754364	0.754364	
40	0.84788	0.84788	
50	0.913965	0.913965	
60	0.947631	0.947631	
70	0.968828	0.968828	
71	0.972569	0.972569	
80	0.985037	0.985037	
90	0.992519	0.992519	
100	0.995012	0.995012	
133	1	1	
150	0.972569	0.972569	
200	0.931421	0.931421	
240	0.866584	0.866584	
300	0.789277	0.789277	
400	0.680798	0.680798	
500	0.557357	0.557357	

Longnose Sucker - Spring and Summer



Section 6

Waterbury/Little River Site - Summary of Results for each Season

Winter

Flow/cfs	Brown Trout	Rainbow Trout	Macro- Invert.s	Longnose Sucker	Longnose Dace
31	0.71508	0.126263	0.184211	N/A	0.481132
40	0.83775	0.252525	0.219298		0.936321
50	0.888614	0.40404	0.412281		1
60	0.909558	0.560606	0.529825		0.982242
70	0.957429	0.611111	0.610526		0.915649
71	0.969397	0.719697	0.621053		0.922309
80	1	0.782828	0.684211		0.874029
90	0.924092	0.919192	0.745614		0.832408
100	0.910891	1	0.780702		0.779134
133	0.825083	0.901229	0.885965		0.685905
150	0.759076	0.768125	0.929825		0.499445
200	0.693069	0.582333	0.974843		0.446171
240	0.623762	0.521326	1		0.333629
300	0.533168	0.393768	0.947368		0.249723
400	0.45813	0.327216	0.719298		0.199778
500	0.421269	0.305031	0.473684		0.18313

Maximum : 1 1 1 1 1

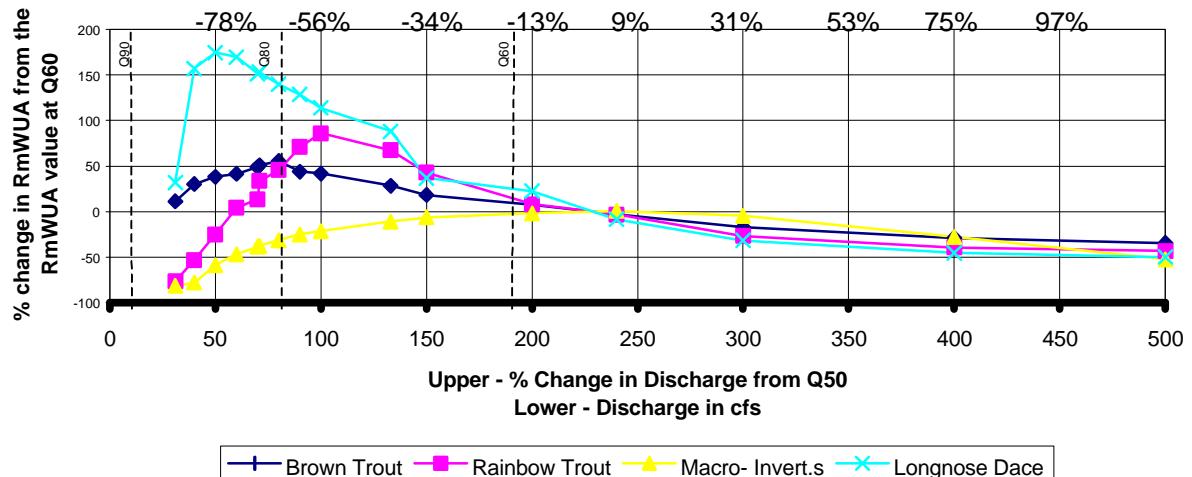
Winter Q50 = 229 interpolated WUA's at Q50 for each species

Brown Trout	Rainbow Trout	Macro- Invert.s	Longnose Sucker	Longnose Dace
0.642822	0.538103	0.993082	0	0.364578

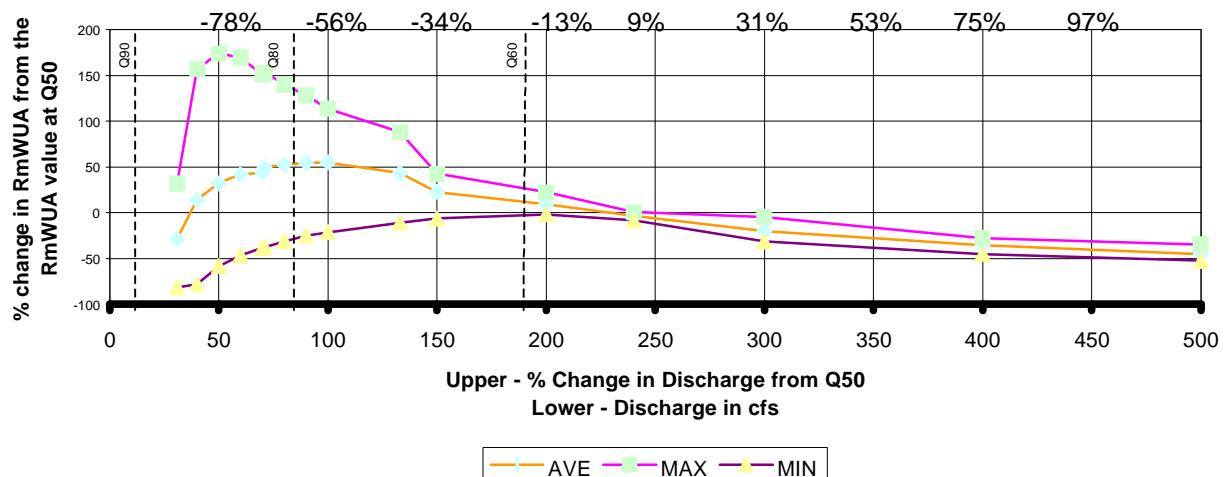
At the given Q reduced for Q50, this is the corresponding
% change in WUA from WUA@Q50 for the species

Flow/cfs	Q50 reduced by this %	Brown Trout	Rainbow Trout	Macro- Invert.s	Longnose Sucker	Longnose Dace	AVE	MAX using all species	MIN
31	86.46288	11.24076	-76.5356	-81.4506		31.9695	-28.694	31.9695	-81.4506
40	82.53275	30.3239	-53.0712	-77.9174		156.823	14.03957	156.823	-77.9174
50	78.16594	38.23643	-24.914	-58.4847		174.2895	32.28182	174.2895	-58.4847
60	73.79913	41.49452	4.181885	-46.6484		169.4187	42.11166	169.4187	-46.6484
70	69.43231	48.9416	13.56764	-38.522		151.153	43.78505	151.153	-38.522
71	68.99563	50.80337	33.74701	-37.4621		152.9796	50.01697	152.9796	-37.4621
80	65.0655	55.56411	45.47921	-31.1023		139.737	52.4195	139.737	-31.1023
90	60.69869	43.75562	70.82075	-24.9192		128.3209	54.49453	128.3209	-24.9192
100	56.33188	41.70196	85.83796	-21.386		113.7084	54.96559	113.7084	-21.386
133	41.9214	28.35323	67.48261	-10.7863		88.13644	43.29649	88.13644	-10.7863
150	34.49782	18.08497	42.74671	-6.36979		36.99256	22.86361	42.74671	-6.36979
200	12.66376	7.816712	8.219531	-1.83661		22.38002	9.144914	22.38002	-1.83661
240	-4.80349	-2.96496	-3.11775	0.696643		-8.48897	-3.46876	0.696643	-8.48897
300	-31.0044	-17.0581	-26.823	-4.60318		-31.5037	-19.997	-4.60318	-31.5037
400	-74.6725	-28.7314	-39.1909	-27.5691		-45.203	-35.1736	-27.5691	-45.203
500	-118.341	-34.4657	-43.3136	-52.3016		-49.7694	-44.9626	-34.4657	-52.3016

Little River/Winter Season/ All Species
 Winter Q50 = 229, Q60 = 190, Q80 = 78.6, Q90 = 12.8 cfs



Little River/Winter Season/ All Species
 Winter Q50 = 229, Q60 = 190, Q80 = 78.6, Q90 = 12.8 cfs



Flow/cfs	Brown Trout	Rainbow Trout	Macro- Invert.s	Longnose Sucker	Longnose Dace
31	0.71508	0.106838	0.184211	0.754364	0.481132
40	0.83775	0.213675	0.219298	0.84788	0.936321
50	0.888614	0.34188	0.412281	0.913965	1
60	0.909558	0.474359	0.529825	0.947631	0.982242
70	0.957429	0.517094	0.610526	0.968828	0.915649
71	0.969397	0.608974	0.621053	0.972569	0.922309
80	1	0.662393	0.684211	0.985037	0.874029
90	0.924092	0.777778	0.745614	0.992519	0.832408
100	0.910891	0.846154	0.780702	0.995012	0.779134
133	0.825083	1	0.885965	1	0.685905
150	0.759076	0.97954	0.929825	0.972569	0.499445
200	0.693069	0.766596	0.974843	0.931421	0.446171
240	0.623762	0.617536	1	0.866584	0.333629
300	0.533168	0.442922	0.947368	0.789277	0.249723
400	0.45813	0.319415	0.719298	0.680798	0.199778
500	0.421269	0.26405	0.473684	0.557357	0.18313

Maximum : 1 1 1 1 1

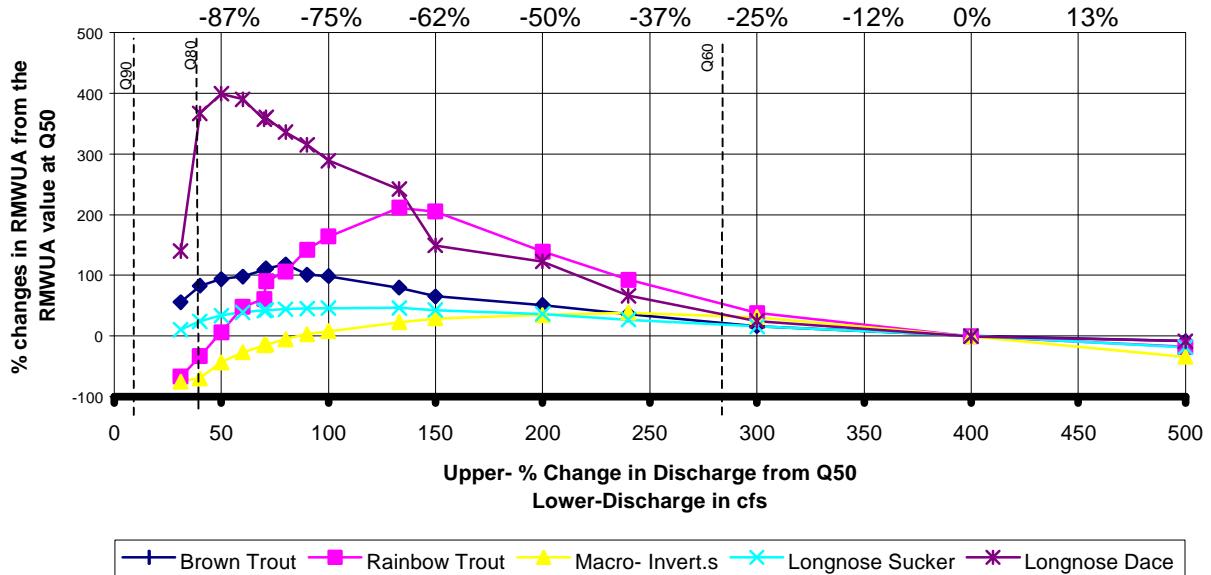
Spring Q50 = 399 interpolated WUA's at Q50 for each species

Brown Trout	Rainbow Trout	Macro- Invert.s	Longnose Sucker	Longnose Dace
0.45888	0.32065	0.721579	0.681883	0.200277

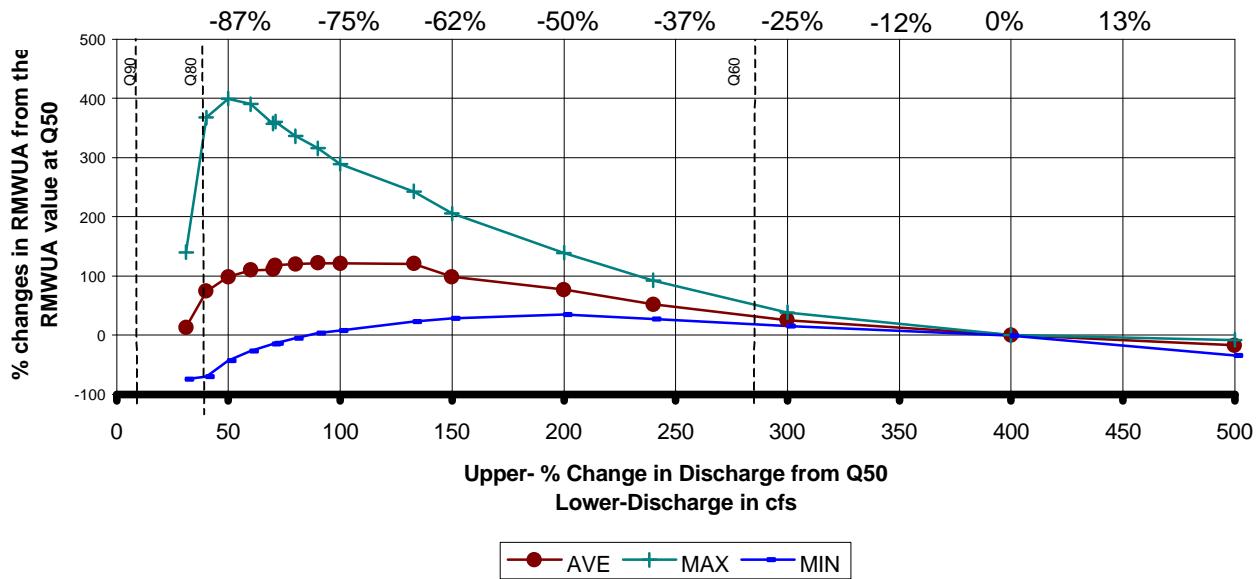
At the given Q reduced for Q50, this is the corresponding
% change in WUA from WUA@Q50 for the species

Flow/cfs	Q50 reduced by this %	Brown Trout	Rainbow Trout	Macro- Invert.s	Longnose Sucker	Longnose Dace	AVE using all species	MAX	MIN
31	92.23058	55.83149	-66.681	-74.4712	10.62958	140.2328	13.10834	140.2328	-74.4712
40	89.97494	82.56409	-33.3619	-69.6086	24.34399	367.5118	74.28988	367.5118	-69.6086
50	87.46867	93.64833	6.620951	-42.8641	34.03551	399.3073	98.1496	399.3073	-42.8641
60	84.96241	98.21244	47.93657	-26.5743	38.9727	390.4406	109.7976	390.4406	-26.5743
70	82.45614	108.6447	61.26419	-15.3902	42.0813	357.1904	110.7581	357.1904	-15.3902
71	82.20551	111.2527	89.91857	-13.9314	42.62988	360.5154	118.077	360.5154	-13.9314
80	79.94987	117.9218	106.5781	-5.1787	44.45846	336.409	120.0377	336.409	-5.1787
90	77.44361	101.3799	142.5627	3.330902	45.55562	315.6276	121.6913	315.6276	3.330902
100	74.93734	98.50303	163.8869	8.193533	45.92133	289.0274	121.1064	289.0274	8.193533
133	66.66667	79.80347	211.8663	22.78142	46.65277	242.4771	120.7162	242.4771	22.78142
150	62.40602	65.41919	205.4855	28.85971	42.62988	149.3766	98.35416	205.4855	28.85971
200	49.87469	51.03491	139.0756	35.09856	36.59553	122.7764	76.91619	139.0756	35.09856
240	39.84962	35.93142	92.58866	38.58497	27.08688	66.58354	52.15509	92.58866	27.08688
300	24.81203		16.189	38.13255	31.29103	15.74963	24.68828	25.2101	38.13255
400	-0.25063		-0.16353	-0.38518	-0.31607	-0.15909	-0.24938	-0.25465	-0.15909
500	-25.3133		-8.19635	-17.6517	-34.3545	-18.2621	-8.56193	-17.4053	-8.19635

Little River/Spring Season/ All Species
Spring Q50 = 399, Q60 = 280, Q80 = 41.2, Q90 = 12.8 cfs



Little River/Spring Season/ All Species
Spring Q50 = 399, Q60 = 280, Q80 = 41.2, Q90 = 12.8 cfs



Flow/cfs	Brown Trout	Rainbow Trout	Macro- Invert.s	Longnose Sucker	Longnose Dace
31	0.884354	0.126263	0.184211	0.754364	0.489831
40	1	0.252525	0.219298	0.84788	0.862295
50	0.928571	0.40404	0.412281	0.913965	0.967882
60	0.918367	0.560606	0.529825	0.947631	1
70	0.897959	0.611111	0.610526	0.968828	0.932203
71	0.877551	0.719697	0.621053	0.972569	0.938983
80	0.897959	0.782828	0.684211	0.985037	0.889831
90	0.693878	0.919192	0.745614	0.992519	0.847458
100	0.673469	1	0.780702	0.995012	0.79322
133	0.561224	0.901229	0.885965	1	0.698305
150	0.612245	0.768125	0.929825	0.972569	0.508475
200	0.612245	0.582333	0.974843	0.931421	0.454237
240	0.632653	0.521326	1	0.866584	0.339661
300	0.55102	0.393768	0.947368	0.789277	0.254237
400	0.473469	0.327216	0.719298	0.680798	0.20339
500	0.435374	0.305031	0.473684	0.557357	0.186441

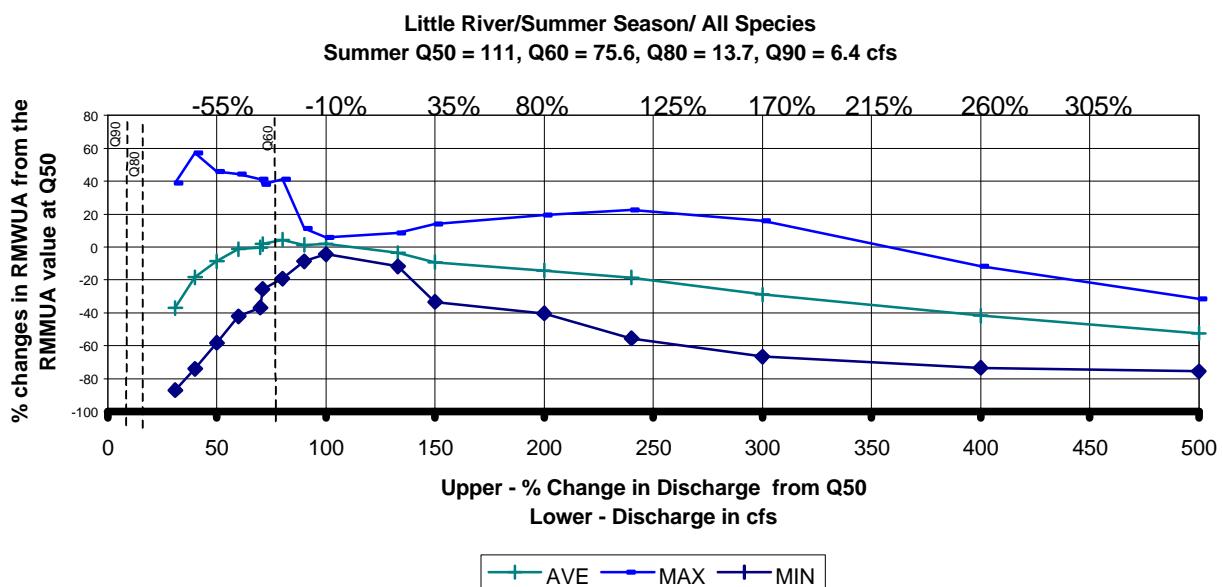
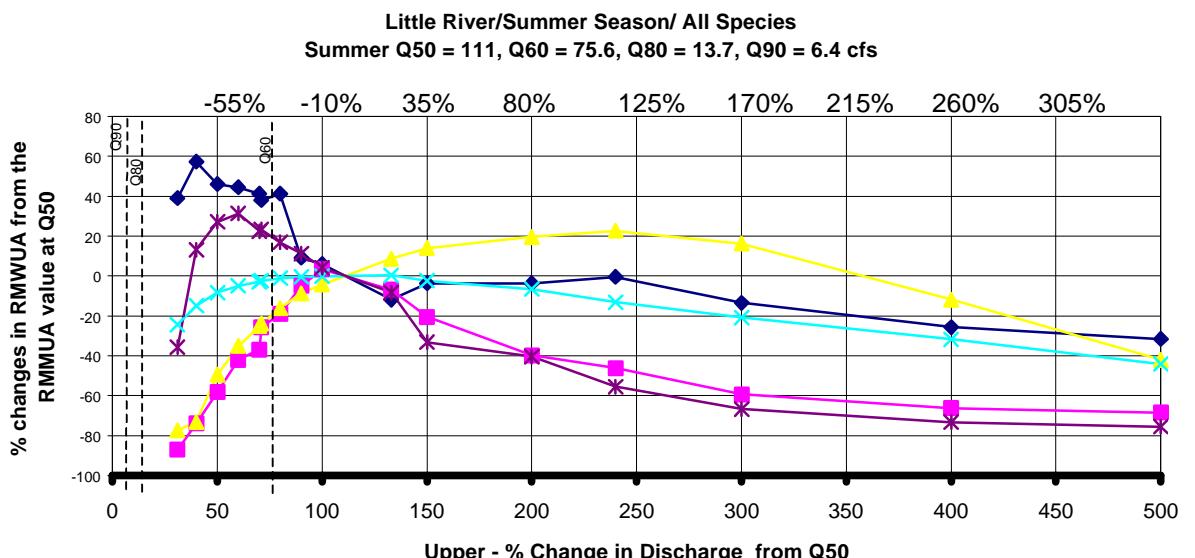
Maximum : 1 1 1 1 1

Summer Q50 = 111 interpolated WUA's at Q50 for each species

Brown Trout	Rainbow Trout	Macro- Invert.s	Longnose Sucker	Longnose Dace
0.636054	0.967076	0.815789	0.996675	0.761582

At the given Q reduced for Q50, this is the corresponding
% change in WUA from WUA@Q50 for the species

Flow/cfs	Q50 reduced by this %	Brown Trout	Rainbow Trout	Macro- Invert.s	Longnose Sucker	Longnose Dace	AVE	MAX	MIN
							using all species		
31	72.07207	39.03743	-86.9439	-77.4194	-24.3119	-35.6825	-37.064	39.03743	-86.9439
40	63.96396	57.21925	-73.8878	-73.1183	-14.9291	13.2242	-18.2983	57.21925	-73.8878
50	54.95495	45.9893	-58.2204	-49.4624	-8.29858	27.08839	-8.58074	45.9893	-58.2204
60	45.94595	44.38503	-42.0308	-35.0538	-4.92077	31.30564	-1.26294	44.38503	-42.0308
70	36.93694	41.17647	-36.8084	-25.1613	-2.79399	22.40356	-0.23673	41.17647	-36.8084
71	36.03604	37.96791	-25.5801	-23.871	-2.41868	23.29377	1.87838	37.96791	-25.5801
80	27.92793	41.17647	-19.0521	-16.129	-1.16764	16.83976	4.333497	41.17647	-19.0521
90	18.91892	9.090909	-4.95147	-8.60215	-0.41701	11.27596	1.279248	11.27596	-8.60215
100	9.90991	5.882353	3.404444	-4.30108	-0.16681	4.154303	1.794644	5.882353	-4.30108
133	-19.8198	-11.7647	-6.80889	8.602151	0.333611	-8.30861	-3.58929	8.602151	-11.7647
150	-35.1351	-3.74332	-20.5725	13.97849	-2.41868	-33.2344	-9.19808	13.97849	-33.2344
200	-80.1802	-3.74332	-39.7842	19.49686	-6.54712	-40.3561	-14.1868	19.49686	-40.3561
240	-116.216	-0.53476	-46.0925	22.58065	-13.0525	-55.4006	-18.5	22.58065	-55.4006
300	-170.27	-13.369	-59.2827	16.12903	-20.809	-66.6172	-28.7898	16.12903	-66.6172
400	-260.36	-25.5615	-66.1645	-11.828	-31.6931	-73.2938	-41.7082	-11.828	-73.2938
500	-350.45	-31.5508	-68.4584	-41.9355	-44.0784	-75.5193	-52.3085	-31.5508	-75.5193



Waterbury/Little River Site - Summary of Results for each Season

Autumn

Flow/cfs	Brown Trout	Rainbow Trout	Macro- Invert.s	Longnose Sucker	Longnose Dace
31	0.71508	0.572549	0.184211	N/A	0.481132
40	0.83775	0.689104	0.219298		0.936321
50	0.888614	0.777031	0.412281		1
60	0.909558	0.838375	0.529825		0.982242
70	0.957429	0.891541	0.610526		0.915649
71	0.969397	0.893585	0.621053		0.922309
80	1	0.930392	0.684211		0.874029
90	0.924092	0.961064	0.745614		0.832408
100	0.910891	0.971289	0.780702		0.779134
133	0.825083	1	0.885965		0.685905
150	0.759076	0.901961	0.929825		0.499445
200	0.693069	0.705882	0.974843		0.446171
240	0.623762	0.568627	1		0.333629
300	0.533168	0.407843	0.947368		0.249723
400	0.45813	0.294118	0.719298		0.199778
500	0.421269	0.243137	0.473684		0.18313

Maximum : 1 1 1 1 1

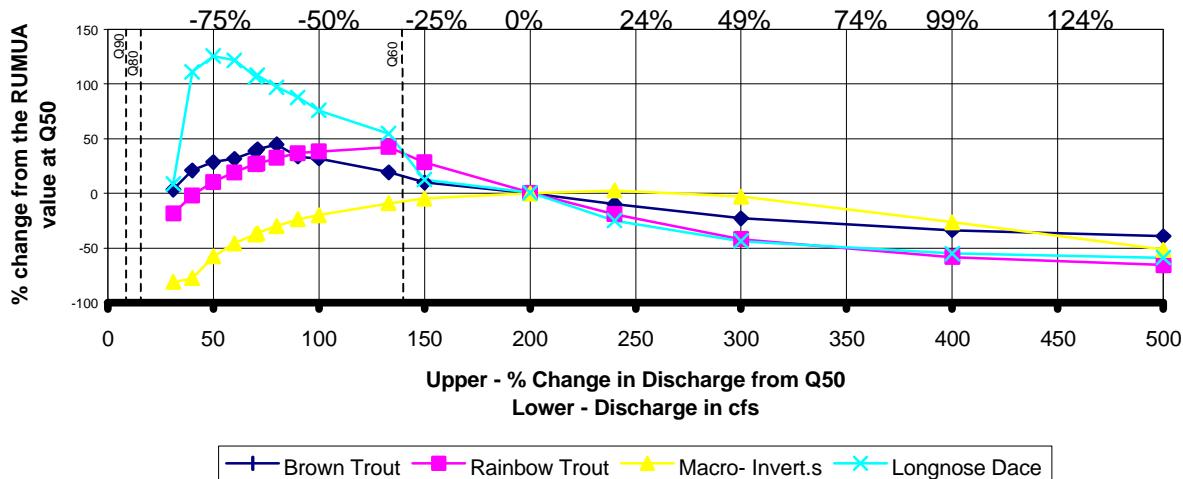
Autumn Q50 = **201 interpolated WUA's at Q50 for each species**

Brown Trout	Rainbow Trout	Macro- Invert.s	Longnose Sucker	Longnose Dace
0.691337	0.702451	0.975472	0	0.443357

**At the given Q reduced for Q50, this is the corresponding
% change in WUA from WUA@Q50 for the species**

Flow/cfs	Q50 reduced by this %	Brown					Rainbow					Macro-					Longnose					Longnose					AVE using all species	MAX	MIN
		Trout	Trout	Invert.s	Sucker	Dace	Trout	Trout	Invert.s	Sucker	Dace	Trout	Trout	Invert.s	Sucker	Dace	Trout	Trout	Invert.s	Sucker	Dace	Trout	Trout	Invert.s	Sucker	Dace			
31	84.57711	3.434392	-18.4927	-81.1157			8.520146	-21.9135				8.520146	-21.9135				8.520146	-21.9135				8.520146	-21.9135				-81.1157		
40	80.0995	21.17837	-1.90011	-77.5187				111.1887	13.23706				111.1887	13.23706				111.1887	13.23706				111.1887	13.23706				-77.5187	
50	75.12438	28.53562	10.61709	-57.7352					125.5517	26.74228				125.5517	26.74228				125.5517	26.74228				125.5517	26.74228				-57.7352
60	70.14925	31.56508	19.35001	-45.6853					121.5463	31.69403				121.5463	31.69403				121.5463	31.69403				121.5463	31.69403				-45.6853
70	65.17413	38.48956	26.91855	-37.4122					106.5262	33.63054				106.5262	33.63054				106.5262	33.63054				106.5262	33.63054				-37.4122
71	64.67662	40.22068	27.20965	-36.3331					108.0282	34.78137				108.0282	34.78137				108.0282	34.78137				108.0282	34.78137				-36.3331
80	60.199	44.64733	32.44941	-29.8585					97.13867	36.09423				97.13867	36.09423				97.13867	36.09423				97.13867	36.09423				-29.8585
90	55.22388	33.6675	36.81587	-23.5637					87.75112	33.66769				87.75112	33.66769				87.75112	33.66769				87.75112	33.66769				-23.5637
100	50.24876	31.75797	38.27136	-19.9667					75.73505	31.44941				75.73505	31.44941				75.73505	31.44941				75.73505	31.44941				-19.9667
133	33.83085	19.34598	42.35869	-9.17574					54.70692	26.80896				54.70692	26.80896				54.70692	26.80896				54.70692	26.80896				-9.17574
150	25.37313	9.798305	28.40195	-4.67949					12.65067	11.54286				12.65067	11.54286				12.65067	11.54286				12.65067	11.54286				-4.67949
200	0.497512	0.250627	0.488486	-0.06447					0.634599	0.327309				0.634599	0.327309				0.634599	0.327309				0.634599	0.327309				-0.06447
240	-19.403	-9.77444	-19.0509	2.514507					-24.7494	-12.7651				-24.7494	-12.7651				2.514507	-12.7651				2.514507	-12.7651				-24.7494
300	-49.2537	-22.8786	-41.94	-2.88099					-43.6747	-27.8436				-43.6747	-27.8436				-2.88099	-27.8436				-2.88099	-27.8436				-43.6747
400	-99.005	-33.7327	-58.1298	-26.2615					-54.9397	-43.2659				-54.9397	-43.2659				-26.2615	-43.2659				-26.2615	-43.2659				-58.1298
500	-148.756	-39.0646	-65.3873	-51.4405					-58.6948	-53.6468				-58.6948	-53.6468				-39.0646	-53.6468				-39.0646	-53.6468				-65.3873

Little River/Autumn Season/ All Species
 Autumn Q50 = 201, Q60 = 144.3, Q80 = 19.6, Q90 = 6.1



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